Prepared for

Duke Energy
526 South Church Street
Charlotte, North Carolina 28202

CLOSURE OPTIONS FEASIBILITY ANALYSIS REPORT

CONCEPTUAL CLOSURE PLAN

L.V. SUTTON PLANT

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EXECUTIVE SUMMARY

Duke Energy Progress (DEP) is currently performing a conceptual closure evaluation to select an appropriate option to close the Coal Combustion Residual (CCR) ponds located at the L.V. Sutton Steam Electric Plant (Sutton Plant; also referred to as the Site). Detailed closure plans will be developed subsequently for the selected closure option. DEP requested Geosyntec Consultants of North Carolina, PC (Geosyntec) evaluate the conceptual closure options. As part of this evaluation, Geosyntec reviewed existing site data, developed and implemented a preliminary site investigation program, performed preliminary data interpretations and analyses and conducted a feasibility analysis of the closure options. Recommendations for the preferred closure options will be made based on this work and discussions with DEP.

The Sutton Plant is located in New Hanover County, near Wilmington, North Carolina, situated between the Cape Fear River to the west and the Northeast Cape Fear River to the east. The Sutton Plant was a three-unit, 575-megawatt (MW) coal-fired power plant. The Plant operated from 1954 until retirement of the coal-fired units in November 2013. Upon retirement of the coal-fired units a new, 625-MW gas-fired unit began operating. Notable features at the Site related to the scope of this report include two CCR ponds (1971 and 1984 Ponds) and a large Cooling Pond. The 1984 Pond was constructed with a 12-in. thick clay liner at the pond bottom which extended along the side slopes where it is protected by a 2-ft thick sand layer. Two other areas of interest include the Lay of Land Area (LOLA) and the 1971 Borrow Area. The CCR ponds at Sutton are estimated to contain a total of about 3.9 million cubic yards (cy) of CCR materials. In addition, there are approximately 1.3 and 0.7 million cy of CCR materials in the 1971 Borrow Area and LOLA, respectively. This results in a potential total CCR in-place volume of 5.9 million cy. The LOLA consists mostly of bottom ash and soil, and the other areas consist of fly ash and bottom ash. Furthermore, chemical analyses showed that the concentrations of CCR-related constituents are lower in the LOLA as compared to CCR materials stored within the adjacent CCR ponds. Also, synthetic precipitation leaching procedure (SPLP) data of materials collected from within the LOLA have indicated that none of the CCR-related constituents appear to be present at leachable concentrations that would likely serve as a potential continuing source to groundwater. The investigations within the approximately 17-acre 1971 Borrow Area revealed the presence of CCR materials at depths of 40 to 45 feet below the top of the water table. The presence of CCR materials in this deeper depth range warrants special technical considerations to evaluate remedial options including excavation and removal for the 1971 Borrow Area. Therefore, closure options were developed by considering separate approaches for the LOLA and the 1971 Borrow Area in relation to the closure options for the CCR ponds.

The following five closure options were considered as part of the conceptual closure evaluation: (i) Option 1.1 involves the removal of CCRs from both the 1971 and 1984 Ponds and containment within an engineered lined landfill to be constructed on Site in a greenfield area; (ii) Option 1.2 involves the removal of CCRs from both the 1971 and 1984 Ponds and containment within an engineered lined landfill to be constructed within the footprint of the 1984 Pond; (iii) Option 2.1 involves the removal of CCRs from the 1971 and 1984 Ponds and transportation via rail to a third-party owned lined structural fill in North Carolina; (iv) Option 2.2 involves the removal of CCRs from the 1971 and 1984 Ponds and transportation via rail to a third-party owned out of state landfill; and (v) Option 2.3 involves the removal of CCRs from the 1971 and 1984 Ponds and transportation via on-road trucks to a third-party owned landfill in North Carolina. Note that the above numbering of options is different from the numbering used in the companion reports that presented the data summary and analysis work previously, as options were changed for this feasibility report due to the pending North Carolina state legislation. The above options were evaluated first as presented above to only include the CCR materials from the 1971 and 1984 Ponds. Subsequently, these analyses were expanded to include CCR and CCR-soil mixtures located within the 1971 Borrow Area and the LOLA. Closure in place was not considered as an option due to the pending North Carolina state legislation.

The closure options presented above were found to be technically feasible, and meet Duke Energy's goals for closure consisting of: (i) providing long-term environmental protection of human health and the environment by reducing or eliminating potential risk of release of constituents from ash; (ii) minimizing infiltration of precipitation into the closed ash basin or ash storage area to minimize generation of leachate by promoting surface drainage and maximizing runoff; (iii) minimizing long-term maintenance costs for the closed area; and (iv) performing closure activities in a safe manner and in coordination with Duke Energy's safety/environmental procedures, and all applicable permits. Each closure option has its associated benefits and costs. Closure options were evaluated using the following criteria: (i) environmental protection; (ii) regulatory or permitting; (iii) cost; (iv) advantages and disadvantages; (v) long-term costs; (vi) timeframe; and (vii) constructability. Based on this evaluation, DEP proposes to further review the analyzed closure options and select the best alternative for closure following pending North Carolina state legislation. Once an alternative is selected critical items for path forward will be evaluated.

The conceptual closure evaluations work is presented in three separate reports as follows: (i) **Preliminary Site Investigation Data Report (Data Report)**; (ii) **Data Interpretation and Analysis Report (I & A Report)**; and (iii) **Closure Options Feasibility Analysis Report (Feasibility Report)**. In addition, two addenda are

submitted under separate cover, which summarize (**Data Report Addendum 1**) and interpret (**I & A Report Addendum 1**) investigations conducted in the LOLA and within the 1971 Borrow Area. The above three reports (and two addenda) may refer to each other and should be considered as companion reports. This **Feasibility Report** presents the feasibility evaluations performed for the conceptual closure options. Conceptual closure options, conceptual grading plans and details, material quantities, cost estimates and closures options evaluations are covered in this report. It also includes a summary of the technical work covered in the **Data Report** and **I & A Report** and can be considered a stand-alone report for reviewing the feasibility of the conceptual closure options.

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1. INTRODUCTION

1.1 Project Background

Duke Energy Progress (DEP) is currently performing a conceptual closure evaluation to select an appropriate option to close the Coal Combustion Residual (CCR) ponds located at the L.V. Sutton Steam Electric Plant (Sutton Plant). Detailed closure plans will be developed subsequently for the selected closure option. DEP requested Geosyntec Consultants of North Carolina, PC (Geosyntec) to evaluate the conceptual closure options. As part of this evaluation, Geosyntec reviewed existing site data, developed and implemented a preliminary site investigation program, performed preliminary data interpretations and analyses and conducted a feasibility analysis of the closure options. Recommendations for the preferred closure options will be made based on this work and discussions with DEP.

The conceptual closure evaluations work is presented in three separate reports as follows:

- **Preliminary Site Investigation Data Report (Data Report)**: This report presents a comprehensive compilation of data from historical site investigations performed by others as well as current site investigations performed by Geosyntec. Site investigation, reconnaissance, and laboratory data are included in this report. **Addendum 1** to the **Data Report** summarizes the results from subsequent investigations in two separate areas (i.e., the LOLA and the 1971 Borrow Area).

- **Data Interpretation and Analysis Report (I & A Report)**: This report presents the data interpretation and analysis performed as part of the conceptual closure options evaluation. Interpretation of the site subsurface stratigraphy, selection of material parameters and preliminary technical analyses for different closure options are presented in this report. **Addendum 1** to the **I & A Report** interprets the results from subsequent investigations in two separate areas (i.e., the LOLA and the 1971 Borrow Area).

- **Closure Options Feasibility Analysis Report (Feasibility Report)**: This report presents the feasibility evaluations performed for the conceptual closure options. Conceptual closure options, conceptual grading plans and details, material quantities, cost estimates and closures options evaluations are covered in this report.

The above three reports (and two addenda) may refer to each other and should be considered as companion reports. However, the **Closure Options Feasibility (Feasibility) Report** presents a summary of the technical work covered in the **Data Report** and **I & A Report** and can be considered a standalone report for reviewing the feasibility of the conceptual closure options. The remainder of this report constitutes the **Feasibility Report**.

1.2 Site Background

The Sutton Plant is located in New Hanover County, near Wilmington, North Carolina, situated between the Cape Fear River to the west and the Northeast Cape Fear River to the east as shown in **Figure 1.F1**. The Sutton Plant was a three-unit, 575-megawatt (MW) coal-fired power plant. The Plant operated from 1954 until retirement of the coal-fired units in November 2013. Upon retirement of the coal-fired units a new, 625-MW gas-fired unit began operating.

Notable features at the Site related to the scope of this report include two CCR ponds and a large Cooling Pond. It is noted that the Cooling Pond is accessible to the general public and is used for recreational purposes. Two other areas of interest include the Lay of Land Area (LOLA) and the 1971 Borrow Area.

The Sutton Plant has two CCR Ponds on site, and they are referred to as: (i) the 1971 Pond; and (ii) the 1984 Pond. The 2011 Dam Information Summary sheet [MACTEC, 2011], provides a detailed summary of the design information for the Ponds. Additional design information is provided in the 5-year dam inspection reports [e.g. MACTEC, 2007]. Most of the information summarized in this section was taken from these reference sources and verified with DEP. **Table 1.T1** summarizes the basic information for each pond.

The 1971 Pond was operated from 1971 to 1985, and since then was used alternatively as needed to allow maintenance for the 1984 Pond until the coal units were shut down in November 2013. The 1984 Pond was operated from 1984 to November 2013. Both ponds contain fly ash, bottom ash, boiler slag, storm water, ash sluice water, coal pile runoff, and low volume wastewater. Since scrubbers were not installed at the Sutton Plant, Flue Gas Desulphurization (FGD) residuals are not expected to be found in the CCR ponds. The 1971 Pond is unlined and was initially constructed with a crest elevation of 18 ft and raised in 1983 to 26 ft mean sea level (MSL). Hence, the 1971 Pond is sometimes referred to as the 1983 Pond. In this report the name 1971 Pond is used. The 1984 Pond was constructed with a 12-in thick clay liner at the pond bottom

which extended along the side slopes where it is protected by a 2-ft thick sand layer. The 1984 Pond crest elevation is 34 ft MSL. In 2006 an Interior Containment Area was constructed within the 1984 Pond with a crest elevation of 42 ft MSL. An area underneath the footprint of the 1971 Pond contains additional CCR materials and is referred to herein as the 1971 Borrow Area.

The Cooling Pond, 1971 Pond and 1984 Pond are operated under the State of North Carolina issued National Pollutant Discharge Elimination System (NPDES) permit number NC0001422 to regulate effluents to the Cape Fear River. Additionally, the dikes of the Cooling Pond, 1971 Pond and 1984 Pond are listed under the North Carolina Department of Environment and Natural Resources (NCDENR) Dam Safety Program. The dam identification numbers for the Cooling Pond, 1971 Pond and 1984 Pond are NEWHA-003, NEWHA-004 and NEWHA-005, respectively. Furthermore the dam inventory lists the cooling pond and 1971 dams as exempt and the 1984 dam as impounding, and hence regulated. These dikes/dams are rated as low hazard by NCDENR. The 2006 Interior Containment Area constructed within the 1984 Pond was permitted and used as a "pond within a pond," where an interior dike was constructed on top of the CCR within the pond; sluiced CCR was excavated from rim ditches, placed within the interior pond, and compacted to heights that are above the exterior pond dikes. This operation was discontinued before reaching the permitted final grades when the Plant was shut down in November 2013.

Both the 1971 and 1984 Ponds have areas of standing water. According to the 2011 Dam Information Summary Sheet [MACTEC, 2011a] the 1971 Pond has a 4-ft diameter vertical outlet riser that connects to a 3-ft diameter pipe that discharges to the Cooling Pond. The 1984 Pond also has a 4-ft diameter vertical riser, which connects to a 3-ft diameter outlet pipe that discharges to the Cooling Pond. In addition, the 1984 Pond also has a gated diversion structure, which allows discharge to be diverted to the Cape Fear River under the NPDES permit.

The LOLA is located between the discharge canal and the coal pile. It is believed that the observed presence of CCR in this area may have been due to the plant operations between approximately 1954 and 1972. Geosyntec understands that the LOLA is on the North Carolina Inactive Hazardous Waste Sites Priority List and was at some point under the North Carolina Department of Environment and Natural Resources (NCDENR) Department of Waste Management (DWM) Inactive Hazardous Sites Branch's voluntary program. Based on the investigation by Geosyntec, the LOLA area has approximately 2 to 15 ft of CCR and soil mixtures.

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1.3 Description of Proposed Closure Options

Five preliminary closure options have been proposed: two onsite landfill options and three offsite landfill and/or structural fill closure options. The closure options are described in detail in **Section 3**. A brief description of each option is provided herein.

- **Option 1.1 - Onsite Greenfield Landfill:** Option 1.1 involves the removal of CCRs from both the 1971 and 1984 Ponds and containment within an engineered lined landfill to be constructed on Site. The landfill would be sited in a greenfield area within the property boundary to the east of the 1984 Pond. This potential landfill area is referred to as the "Landfill Area" throughout this report. The landfill would then be closed with an engineered cover.

- **Option 1.2 – Onsite Landfill within the Excavated 1984 Pond Footprint:** Option 1.2 involves the removal of CCRs from both the 1971 and 1984 Ponds and containment within an engineered lined landfill to be constructed within the footprint of the 1984 Pond. The landfill would then be closed with an engineered cover. This option will include staged excavation and CCR management during construction of the landfill.

- **Option 2.1 – Offsite Disposal in a Lined Instate Structural Fill:** Option 2.1 involves the removal of CCRs from the 1971 and 1984 Ponds and transportation via rail to a third party owned lined structural fill in North Carolina.

- **Option 2.2 – Offsite Disposal in an Out of State Landfill:** Option 2.2 involves the removal of CCRs from the 1971 and 1984 Ponds and transportation via rail to a third party owned out of state landfill.

- **Option 2.3 – Offsite Disposal in an Instate Landfill:** Option 2.3 involves the removal of CCRs from the 1971 and 1984 Ponds and transportation via on road truck to a third party owned landfill in North Carolina.

Note that the above numbering of options is different from the numbering used in the companion reports that presented the data summary and analysis work previously, as options were changed for this **Feasibility Report** due to the pending North Carolina state legislation.

The above options will be evaluated first as presented above to only include the CCR materials from the 1971 and 1984 Ponds. Subsequently, these analyses will be expanded to include CCR and CCR-soil mixtures located within the 1971 Borrow Area

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and LOLA. Closure in place was not considered as an option for the **Feasibility Report** due to the pending North Carolina state legislation. It is noted that the **Data Report** and the **I & A Report** included in-place closure options as that concept was considered during the initial stages of the conceptual closure evaluation work before details of the pending North Carolina state legislation were available.

1.4 Report Organization

As stated earlier, this **Feasibility Report** presents the feasibility evaluations performed for the conceptual closure options. Conceptual closure options, conceptual grading plans and details, material quantities, cost estimates and closures options evaluations and ranking will be covered in this report.

- **Section 2** presents the closure considerations;
- **Section 3** presents the closure alternatives;
- **Section 4** presents the closure alternatives evaluation;
- **Section 5** includes a list of cited references.

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2. CLOSURE CONSIDERATIONS

Duke Energy defines the overall goals of closure for the purpose of selecting the most appropriate closure option as follows:

- Provide long-term environmental protection of human health and the environment by reducing or eliminating potential risk of release of constituents from ash;
- Minimize infiltration of precipitation into the closed ash basin or ash storage area to minimize generation of leachate by promoting surface drainage and maximizing runoff;
- Minimize long-term maintenance costs for the closed area; and
- Perform closure activities in a safe manner and in coordination with Duke Energy's safety/environmental procedures, related company guidance documents and all applicable permits.

Duke Energy recommends considerations such as: (i) current and future land uses; (ii) local zoning regulations; (iii) type of facility to be closed; (iv) types and quantities of ash in the facility; (v) potential impact of closure to operations; (vi) types of closure options; and (vii) regulatory considerations be part of the closure considerations. The above considerations and site-specific technical considerations are discussed in the following sections.

2.1 Current and Future Land Uses

The coal-fired units at the Sutton Plant were retired, and planned to be demolished as part of plant decommissioning. There is a new gas-fired combined cycle power plant operating at the plant site at present. Based on information provided by DEP, there are no end use plans for the CCR pond areas at this time. It is noted that DEP has leased land to a developer to operate a solar energy generating facility near the Sutton Plant, and as such beneficial reuse options may be considered as part of CCR pond closure. It is assumed that the current discharge canal and Cooling Pond will remain and serve the gas-fired power plant that is operating. In addition, the Cooling Pond will remain open to the public for recreational use.

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2.2 Local Zoning Regulations

Local zoning plays a key role if onsite CCR landfills are to be developed as part of CCR pond closure.

The Sutton Plant is located in zoning district I-2 (Heavy Industrial District). New sanitary landfills are permitted in New Hanover County in the I-2 zoning district provided that no refuse, buildings or structures are located within fifty feet of the nearest property line [New Hanover County Zoning Ordinance Section 72-13(1)]. The zoning ordinance defines a sanitary landfill as "a facility for the disposal of solid waste on land…" and defines solid waste as "any garbage, refuse, septage, sludge, or any other waste material that is not considered hazardous by the United States Environmental Protection Agency or the North Carolina State Department of Human Resources, Solid and Hazardous Waste Branch". CCR materials can be considered to satisfy this definition.

2.3 Type of Facility to be Closed

The types of facilities to be closed at Sutton are CCR ponds or basins for the 1971 and 1984 Ponds. The LOLA and the 1971 Borrow Area may be classified as storage areas. There are no CCR stacks or landfills at Sutton Plant.

2.4 Types and Quantities of Ash in the Facility

Table 2.T1 presents calculated quantities and types of CCR materials at each CCR pond and the LOLA. Details and assumptions that were part of the calculations are discussed in **Section 4.1**. Based on these calculations, the CCR ponds at Sutton have a total of about 3.9 million cubic yards (cy) of CCR materials. There are additional 1.3 and 0.7 million cy of CCR materials in the 1971 Borrow Area and LOLA, respectively. This results in a potential total CCR in place volume of 5.9 million cy. The LOLA consists mostly of bottom ash and soil, and the other areas consist of fly ash and bottom ash. Since scrubbers were not installed at the Sutton Plant, Flue Gas Desulphurization (FGD) residuals are not expected to be found in the CCR ponds.

2.5 Potential Impacts of Closure to Operations

Since the coal-fired units at the Sutton Plant were retired, no significant impacts to plant operations are anticipated due to the closure of CCR ponds. Based on information provided by DEP, some of the plant area storm water is being pumped into the 1971 Pond. It is Geosyntec's understanding that alternate measures will be implemented to

manage this storm water without routing to the 1971 Pond once the NPDES permit modification approval is obtained.

2.6 Types of Closure Options to be Considered

General options considered for closure of the CCR ponds include: (i) excavation and removal; (ii) closure in place; (iii) hybrid closure; and (iv) closure and reuse. Based on the preliminary evaluation of the generic closure options, more specific closure options or alternatives were selected for detailed evaluation. **Section 3** presents the types of closure options considered. It is noted that closure in place was not considered as an option for the **Feasibility Report** due to the pending North Carolina state legislation.

2.7 Regulatory Considerations

2.7.1 General Closure

The Cooling Pond, 1971 Pond and 1984 Pond are operated under the State of North Carolina issued NPDES permit number NC0001422 to regulate effluents to the Cape Fear River. Additionally, the dikes of the Cooling Pond, 1971 Pond and 1984 Pond are listed under the North Carolina Department of Environment and Natural Resources (NCDENR) Dam Safety Program. The dam identification numbers for the Cooling Pond, 1971 Pond and 1984 Pond are NEWHA-003, NEWHA-004 and NEWHA-005, respectively. Furthermore the dam inventory lists the cooling pond and 1971 dams as exempt and the 1984 dam as impounding, and hence regulated. These dikes/dams are rated as low hazard by NCDENR.

The United States Environmental Protection Agency (USEPA) proposed regulations under the Resource Conservation and Recovery Act (RCRA) for CCRs [USEPA, 2010]. While both Subtitle C (hazardous waste) and D (nonhazardous waste) options were proposed, it is generally expected that the final regulations, if passed, will most likely be based on Subtitle D and would be administered by the states. The capping or cover system requirement for the Subtitle D option would be similar to the design requirements for final covers for Industrial Nonhazardous Solid Waste or Municipal Solid Waste (MSW) landfills.

It is our understanding that DEP may be interested in using CCR pond closure as a source control measure of an anticipated groundwater remedy under NC groundwater regulations 15A NCAC 2L.0106. It is noted herein that the term “closure”, in general, refers to: (i) in-place closure by installation of a cover system (i.e. discontinuing pond operations, removing free water, and installing a cover), which is not considered for

Sutton due to pending regulation; (ii) excavation and removal (i.e. removing CCR materials, and disposing in lined landfills onsite or offsite); or (iii) other similar measures or combination of measures. The above usage is consistent with the terminology used in the solid waste industry. The term "closure" as referred to herein does not imply meeting target groundwater cleanup standards. In addition, the State of North Carolina is considering special legislation to address closure and management of CCR ponds. The details of this pending legislation will apply for closure of CCR ponds at Sutton.

2.7.2 Surface Water

As stated earlier, effluents from the CCR Ponds are regulated under a NPDES permit. Because the regulation of stormwater discharges from closed ash basins is not explicitly and appropriately covered under an existing NPDES permit, and the disposition of existing individual NPDES Stormwater Permit for the Site is unclear with respect to the closure of the ash basins, it is recommended that discussions be held with the regulators from the NCDENR Division of Energy, Mineral, and Land Resources - Stormwater Permitting Program to achieve consensus on the NPDES permitting strategy for the Site.

Stormwater discharges from the project Site will require coverage under federal, state, and local programs, for post-construction design/development and operations related to site usage, and for construction activities. Following is the list of stormwater permits and regulatory programs applicable to the project.

- National Pollutant Discharge Elimination System (NPDES)
    - Administered by the North Carolina Department of Environment and Natural Resources (NCDENR) – Stormwater Permitting Program
    - Industrial Activities – either: (i) continuation and modification of the existing individual NPDES Stormwater Permit for the Site; or (ii) rescission (i.e., termination) of the existing NPDES Stormwater Permit and new coverage under North Carolina General Stormwater Permit No. NCG120000.
    - General Stormwater Permit for Construction Activities, NCG010000
- New Hanover County

- Stormwater Ordinance/Stormwater Permit
- Flood Damage Prevention Ordinance/Flood Development Permit
- Soil Erosion and Sedimentation Control Ordinance/Land Disturbing Permit

2.7.3 Dam Safety

NCDENR [2014] provided guidelines for decommissioning coal ash ponds and potentially exiting the NC Dam Safety Program. These guidelines include requirements for:

- geotechnical investigation plan and geotechnical report that includes details of the stability and flow potential of the contained CCR materials under static and dynamic loading conditions;
- topographic map of the existing conditions;
- preparation of a breach plan;
- vegetation and stabilization plan; and
- statement indicating that ponds have not received sluiced ash for more than three years.

2.7.4 Onsite Landfill

The following state regulations are applicable for the onsite landfill option.

- Groundwater Separation Requirements: The Solid Waste Management Provisions of the North Carolina Administrative Code (NCAC) state that a disposal site shall be designed so that the bottom elevation of solid waste is a minimum of four feet above the seasonal high water table.
- Buffer Requirements: The Solid Waste Management Provisions of the NCAC state that a disposal site, except a land clearing and inert debris landfill, shall meet the following buffer requirements:
    - A 50-foot minimum buffer between all property lines and disposal areas;

- A 500-foot minimum buffer between private dwellings and wells and disposal areas; and
- A 50-foot minimum buffer between streams and rivers and disposal areas [15 NCAC 13B.0503(2)(f)].

- Surface Water Classifications and Water Quality Standards: The Cape Fear River adjacent to the Cooling Pond is classified as a Class C (Aquatic Life, Secondary Recreation, Fresh Water) and a Class SW (Swamp Waters) surface water. The NCAC does not prohibit new landfills in Class C and Class SW watersheds [15A NCAC 02B.0200].

It is noted that additional requirements may be applicable based on the pending legislation by the State of North Carolina.

The following county regulations are applicable for the onsite landfill option.

- New Hanover County's municipal code does not include additional groundwater separation, buffer, or water quality standards more restrictive than those set forth by the State of North Carolina.
- A County variance is required for new solid waste disposal facilities located in a Special Flood Hazard Area or a Future Conditions Flood Hazard Area per Article 4, Section E(10) of the New Hanover County Flood Damage Prevention Ordinance.
- A Special Use Permit may be required for the landfill option. It is assumed that the management of CCRs in the ponds is a land use allowed under the Sludge Disposal provision. Whether the landfill option would constitute a continuation of this use or would require a Special Use Permit for landfilling, would likely require a determination from New Hanover County.

2.8 Technical Considerations

Technical considerations for the evaluated closure options are discussed in this section. For each technical consideration, a brief description of the site investigation and evaluation work performed is presented followed by discussion of the impact to closure options. Detailed descriptions of the site investigation and evaluation work are presented in the **Data Report** and **I & A Report**, respectively. **Appendix 2.A1**

presents a summary of key figures from the above referenced reports that are relevant to this section.

2.8.1 Flood Plain

The 100-year flood elevation at the Site is 8 ft (NAVD88) based on the Flood Insurance Rate Map as discussed in the I & A Report. The closure option locations are located above this 100-year flood elevation as discussed below.

- 1971 Pond dikes have a crest elevation of 28 ft. 1984 Pond dikes have a crest elevation of 34 ft with the interior dike (2006 Storage Area) crest elevation at 42 ft.
- The LOLA ground elevation varies from 10 to 15 ft.
- The greenfield landfill area (Option 1.1) has a ground elevation of 10 to 15 ft.
- The onsite landfill within the excavated 1984 Pond footprint (Option 1.2) will have a base ground elevation footprint of 14 ft, which is the elevation of top of the existing clay liner within the 1984 Pond.

While the above discussed elevations are above the 100-year flood elevation of 8 ft at the Site, the Flood Insurance Rate Map (FIRM) indicates that areas of the 1984 Pond are within the floodplain, presumably based on outdated information. **Figure 1** in **Appendix 2.A1** depicts the CCR pond areas superimposed onto the FIRM. A flood map revision may be needed to facilitate the development of Option 1.2.

2.8.2 Stormwater Management

The I & A Report presents a summary of the stormwater management systems (SWMS) associated with the conceptual closure options for the CCR ponds (i.e., the 1971 and 1984 Ponds) at the Sutton Plant. The SWMS are designed to regulate the quantity and quality of stormwater runoff generated by the closed CCR ponds using Best Management Practices (BMPs) to minimize impacts to water quality and alterations to the hydrology of receiving water bodies. Wet detention ponds and open channel storage and conveyance features were considered at this conceptual stage. The results demonstrate that the conceptual designs presented in **Section 3**, using the selected BMPs, achieve the minimum stormwater treatment and attenuation requirements of the local stormwater ordinance. A more detailed design will need to be developed for the selected closure option as part of the final closure plans.

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2.8.3 Geotechnical

The results of the preliminary geotechnical investigations and evaluations were presented in detail in the Data Report and I & A Report, respectively. The field investigation performed by Geosyntec consisted of 11 soil test borings (six through the perimeter dikes, three within the CCR ponds and two within an area evaluated for a potential onsite landfill), 14 Cone Penetration Test (CPT) soundings (including six seismic CPT [SCPT] soundings) and six geoprobes (GP). **Figure 2** in **Appendix 2.A1** depicts the sampling locations for the geotechnical investigation. Porewater dissipation tests were performed at nine selected CPT and SCPT locations. Additionally, two piezometers were installed, one within the 1971 Pond and one within the 2006 Interior Containment Area. In addition, standard geotechnical laboratory tests were performed on collected soil and CCR field samples.

Subsequent to the initial investigation within the CCR ponds, Geosyntec conducted an additional investigation within the 1971 Pond using 14 geoprobe borings to delineate CCR materials located below the bottom design elevation of this pond. Based on the likely historical use of this area as a borrow area for soils, which appears to have been backfilled with CCR materials, this deeper area containing CCR materials has been termed the 1971 Borrow Area.

The subsurface stratigraphy at the Site was developed based on the available information obtained from the historical geotechnical investigations and the 2014 Geosyntec conceptual closure geotechnical investigation, as presented in the Data Report. The results of the investigations and information based on regional geology indicated that the subsurface soils primarily consist of, from top to bottom, the CCRs (within the ponds) or Dike Fill (on the perimeters of the ponds), and Foundation Soils (consist primarily of sand with varying amounts of silt at the top and Peedee Formation clayey soils at the bottom). Select cross-sections are depicted in **Figures 3 and 4** in **Appendix 2.A1**.

Preliminary slope stability, liquefaction, CCR flow potential, and settlement analyses were performed and indicated that an appropriate closure design can be developed to meet the geotechnical considerations. Removal of deeper CCR deposits located below the water table within the 1971 Borrow Area by excavation may pose constructability challenges if chosen as part of the closure option. Detailed calculations will be performed as part of the final closure design after the closure option for the CCR ponds is selected.

A preliminary supplemental investigation was performed within the LOLA to vertically delineate the extent of CCR materials within this area. Previous delineation efforts focused on the horizontal extent of these materials, and several historical boring logs indicated that CCR materials were still present at the bottom of the borings. The preliminary supplemental investigation revealed the presence of a mix of CCR and soil materials to a depth of up to about 15 feet below ground surface (bgs), with several locations indicating the presence of the CCR mix below the water table. More details about the investigation were presented in Addenda 1 to both the Data Report and the I & A Report.

2.8.4 Hydrogeology and Groundwater Flow

The Site is located within the southeastern part of the Coastal Plain of North Carolina and is situated on a peninsula between the Atlantic Ocean and the Northeast Cape Fear and Cape Fear Rivers. The Cape Fear River constitutes the western boundary of the Site. The remaining area surrounding the Site is a mixture of residential and industrial properties. One of the predominant features of the Site is the Cooling Pond, which covers an area of 1,110 acres. The water level in the Cooling Pond is approximately five to eight feet above the level of the Cape Fear River. The elevation of the water in the Cooling Pond strongly influences groundwater flow in the local area. The Site is underlain by 50 to 75 feet of unconsolidated sediments consisting primarily of well drained sands of late Tertiary age and Quaternary surficial deposits. The Cretaceous Peedee Formation underlies the surficial deposits in the local area and typically consists of unconsolidated green to dark-gray silt, olive-green to gray sand, and massive black clay with unconsolidated calcareous sandstone and impure limestone. The Peedee Formation is approximately 700 feet thick in New Hanover County. A regional geological cross-section is provided in **Figure 5** in **Appendix 2.A1**. More details including the hydrogeology of the Site and groundwater flow are discussed in the **I & A Report**.

Groundwater flow modeling was performed to simulate future groundwater conditions at the Site under various post-closure scenarios and to assist in evaluating potential closure options. Pursuant to this, the modeling effort consisted of three objectives: (i) creating a steady-state groundwater model of the Site that is calibrated to groundwater conditions observed in May 2014; (ii) using the calibrated model, run predictive scenarios to simulate some of the closure conditions; and (iii) evaluating the predicted water table elevation relative to the bottom of the CCR material in both CCR ponds following closure. MODFLOW-2005 (a specific version of the MODFLOW suite of software) was used to simulate groundwater flow at the Site. Based on the simulation,

the water table generally falls below the interpreted bottom of the CCR ponds following closure. **Figure 6** in **Appendix 2.A1** depicts the water table elevations generated from the groundwater model. It is noted that the 1971 Borrow Area is currently under the water table, and will remain so if not excavated as part of closure. The groundwater model can be refined and re-calibrated with greater confidence after additional data collection during the final design of the selected closure option. The **I & A Report** presents more details of the groundwater flow modeling.

The groundwater elevations at the Site are influenced by the water level of the Cooling Pond (about 8.5 ft) and to a lesser degree by the groundwater pumping wells in the vicinity of the Site. The groundwater modeling discussed above indicates that groundwater levels after closure for the onsite closure options considered will remain around 9 to 11 ft elevation. This level will provide adequate separation from the liner for these options. While this groundwater level is below the interpreted 1971 Pond bottom, as noted earlier, CCR materials and CCR-soil mixtures are present below the water level within the 1971 Borrow Area and LOLA, respectively.

2.8.5 Groundwater Quality and Geochemistry

As part of the evaluation of closure options for the CCR ponds, Geosyntec performed hydrogeologic and environmental site assessment activities to supplement historical assessment data collected by other consultants. These activities were implemented in May 2014 and included the following elements: (i) eight groundwater piezometers (four shallow and four intermediate-depth) near the toe of the pond dikes, two porewater piezometers within the CCR ponds, and three intermediate-depth and four deep groundwater monitoring wells outside of the CCR ponds were installed to evaluate water levels and potential impacts to groundwater in the surficial aquifer at the Site; (ii) four staff gauges were installed at certain surface water locations to facilitate monitoring of surface water elevations; (iii) soil samples from background locations, from CCRs within the CCR ponds, from native soil below the CCR materials in the ponds, and from monitoring well borings located around the CCR ponds were collected and analyzed for constituents of interest (COIs); (iv) groundwater and CCR porewater samples were collected and analyzed for COIs from the newly installed and certain non-compliance monitoring wells and piezometers located throughout the Site; and (v) aquifer performance testing was conducted within one CCR piezometer to obtain an estimate of the hydraulic conductivity within the CCR ponds, and five groundwater monitoring wells were outfitted with pressure transducers to evaluate background aquifer conditions. **Figure 7** in **Appendix 2.A1** depicts the locations of the newly

installed wells, piezometers, and staff gauges. The field activities and the results from this investigation are described in the **Data Report**.

The **I & A Report** discussed the analytical results for the CCR materials, background soil samples, soil samples from monitoring wells outside of the CCR ponds as well as soil samples from locations below the CCR materials. Furthermore, the **I & A Report** also discussed the analytical results obtained for groundwater and CCR porewater samples.

Background groundwater results indicated naturally acidic groundwater conditions and naturally elevated levels of iron, and to a lesser degree, manganese. Groundwater in the immediate vicinity of the 1971 Pond appeared to show an impact of CCR materials contained within and below this pond. Monitoring points closer to the 1984 Pond show a diminishing impact, suggesting that the pond's clay liner provides some protection of the surrounding groundwater. Furthermore, within 500 ft of the waste boundary, elevated arsenic concentrations in groundwater attenuated to below the groundwater standard in all but one of the compliance wells. **Figure 8** in **Appendix 2.A1** depicts arsenic concentrations in select groundwater and CCR porewater monitoring locations. In addition, leaching tests indicated that the CCR materials did not leach elevated levels of boron, and therefore, boron concentrations in excess of the groundwater standard in compliance wells will likely decrease over time since the source appears to have been depleted. However, groundwater withdrawal in the vicinity of the Site may affect groundwater flow, and therefore, the migration potential of boron. **Figure 9** in **Appendix 2.A1** depicts boron concentrations in select groundwater and CCR porewater monitoring locations. Selenium concentrations are generally low throughout the Site, but the well pair to the north of the 1984 Pond and a newly installed deep well near the northeastern corner of the compliance boundary indicate concentrations in excess of the groundwater standard. Given the low selenium concentrations within the CCR porewater and the low current leachability of selenium as indicated in the SPLP leaching results, it is believed that these two detections are likely the result of past leaching. **Figure 10** in **Appendix 2.A1** depicts selenium concentrations in select groundwater and CCR porewater monitoring locations.

A geochemical Conceptual Site Model (CSM) was developed to explain the distribution of the analyzed constituents of interests (COIs) in soil and groundwater. The CSM suggested that metals mobility was quite limited under the given geochemical conditions. With respect to arsenic, this is mainly due to its presence in the less mobile arsenate form. **Figure 11** in **Appendix 2.A1** depicts an Eh-pH diagram for arsenic with site-specific data superimposed to illustrate the likely speciation of arsenic at the Site.

Implementation of the closure options at locations where the CCRs are above the water table will partially remove the source. However, the apparent deep nature of the CCR materials within the 1971 Borrow Area (i.e., below the water table), may have a residual influence on the distribution of constituents (i.e., mainly arsenic) in groundwater, if appropriate remedial measures are not implemented. Moreover, boron concentrations are believed to be the result of the historical leaching and will be difficult to completely eliminate regardless of the final closure option selected.

2.8.6 Environmental Risk Evaluation

The **I&A Report** described a framework for a site-specific risk-based approach to further evaluate the analytical results for environmental media in the context of potential human and ecological receptors that may be exposed to constituents of interest (COIs) associated with the CCR ponds. Since all closure options considered will include an engineered cover, there will not be direct exposure to the CCR materials post-closure, and this potential exposure route is not considered for human receptors.

A water supply well survey conducted within ½ mile of the compliance boundary (located 500 feet from the pond boundaries and the LOLA) identified the following water supply wells: (i) eight on-site industrial water supply wells (seven of those operational), (ii) three off-site water supply wells on the Invista property, (iii) two operational public water supply wells owned and operated by the Cape Fear Public Utility Authority (CFPUA), and (iv) approximately 18 possible water supply wells that were observed, have been reported, or are assumed to be located within the survey area. **Figure 12** in **Appendix 2.A1** depicts the results of the water supply well survey.

Annual environmental monitoring of the Cooling Pond, located to the west of the CCR ponds, has been conducted since 1972 that includes the collection of surface water, sediment, and fish tissue samples for analytical chemistry, as well as biological assessments of aquatic vegetation and fish community health. Monitoring reports acknowledge that operations of the Sutton Plant, specifically effluents associated with the CCR ponds, have contributed to trace element accumulation in water, sediments, and fish tissues in the Cooling Pond. Although not applicable to the Cooling Pond due to its status as a treatment pond operated under a NPDES permit, surface water concentrations are generally below water quality standards, and selenium concentrations in fish tissue are below consumption advisory limits. Continued monitoring in accordance with DEP's ongoing environmental monitoring program will allow evaluating the effects of the final closure of the CCR ponds on environmental media.

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3. CLOSURE ALTERNATIVES

This section discusses closure alternatives and presents the conceptual closure plans for the selected alternatives. The conceptual closure plans consist of preliminary conceptual drawings for the closure alternatives.

3.1 Closure Alternatives

3.1.1 Overview

Closure options for CCR ponds in general include: (i) Excavation and Removal; (ii) Closure in Place; (iii) Hybrid Closure; and (iv) Closure and Reuse. These closure options and a "no action" baseline are discussed below.

3.1.2 No Action

Closure alternatives evaluations typically consider a no action alternative for comparison purposes.

3.1.3 Excavation and Removal

Excavation and removal is defined as the removal of all CCR materials and any impacted underlying soil from a CCR Pond and restoring the area for appropriate end use or establishment of natural habitat. This may require meeting state-specific numeric cleanup levels for impacts to the soil from the ash. The removed ash and contaminated soil can be: (i) disposed in a permitted (lined) landfill offsite; (ii) disposed in a permitted (lined) landfill onsite; (iii) used as part of improving the closure grading of another CCR pond onsite; or (iv) beneficially reused as allowed by applicable regulations. Excavation and removal can be a "source removal" based remedy for a site with groundwater exceedances.

3.1.4 Closure in Place

Closure in Place for CCR Ponds can be performed by eliminating free liquid, consolidating or stabilizing the CCR materials (by dewatering or other means to the extent needed) to support the final cover, and installing an engineered cover system. Cover installation will need to be performed by removing vegetation, grading the slopes to an acceptable grade, and installing an engineered cover system. Post-closure care would involve monitoring and/or maintaining the integrity of the cover system and potential groundwater monitoring. The Closure in Place can be a "source control" based remedy for a site with groundwater exceedances due to the cover's ability to

minimize infiltration of precipitation through the CCR, thereby, reducing the potential impacts to groundwater.

3.1.5 Hybrid Closure

Hybrid Closure involves closing a portion of a CCR pond by excavation and removal while other areas of the pond or site are closed in place. Hybrid closure may be used to: (i) consolidate the ponded CCR material within a smaller part of a CCR pond footprint; or (ii) consolidate the CCR materials from several CCR ponds at a site into a single CCR pond. This may be done to minimize the footprint of the CCR materials and area needing a final cover. The Hybrid Closure can be a "source removal" measure for part of the site/pond and "source control" measure for the remaining parts with regards to serving as a remedial measure for a site with groundwater exceedances.

3.1.6 Closure and Reuse

Closure & Reuse consists of incorporating future site use(s) into the closure. Possible reuse options for closed CCR Pond sites include: (i) construction of CCR landfills; (ii) construction of waste water treatment components; (iii) use as laydown or parking areas; and (iv) development of renewable energy generation areas, such as solar farms. The closure grading and cover system options will need to be designed by considering the end use options, while still balancing the need for closure to be used as a remedial measure for a site with groundwater exceedances.

3.1.7 Alternatives Selected for Conceptual Closure Grading Options

Five preliminary closure options have been proposed: two onsite landfill options and three offsite landfill and/or structural fill closure options. A description of each option is provided herein.

- **Option 1.1 – Onsite Greenfield Landfill:** Option 1.1 involves the removal of CCRs from both the 1971 and 1984 Ponds and containment within an engineered lined landfill to be constructed on Site. The landfill would be sited in a greenfield area within the property boundary to the east of the 1984 Pond. This potential landfill area is referred to as the "Landfill Area" throughout this report. The landfill would then be closed with an engineered cover. This will classify as "Excavation and Removal" option.

- **Option 1.2 – Onsite Landfill within the Excavated 1984 Pond Footprint:** Option 1.2 involves the removal of CCRs from both the 1971 and 1984 Ponds

and containment within an engineered lined landfill to be constructed within the footprint of the 1984 Pond. The landfill would then be closed with an engineered cover. This option would include staged excavation and CCR management during construction of the landfill. This will classify as "Closure and Reuse" option.

- **Option 2.1 – Offsite Disposal in a Lined Structural Fill:** Option 2.1 involves the removal of CCRs from the 1971 and 1984 Ponds and transportation via rail to a third party owned lined structural fill in North Carolina. This will classify as "Excavation and Removal" option for the Sutton Site and "Closure and Reuse" for the offsite structural fill site.

- **Option 2.2 – Offsite Disposal in an Out of State Landfill:** Option 2.2 involves the removal of CCRs from the 1971 and 1984 Ponds and transportation via rail to a third party owned out of state landfill. This will classify as "Excavation and Removal" option.

- **Option 2.3 – Offsite Disposal in an Instate Landfill:** Option 2.3 involves the removal of CCRs from the 1971 and 1984 Ponds and transportation via on-road truck to a third party owned landfill in North Carolina. This will classify as "Excavation and Removal" option.

Note that the above numbering of options is different from the numbering used in the companion reports that presented the data summary and analysis work previously, as options were changed for this feasibility report due to the pending North Carolina state legislation.

3.2 Cover System

Cover system selection and design will be performed for the selected closure option as part of the final design. The following cover system was assumed for the onsite closure options for cost evaluation purposes.

- 0.5-ft thick topsoil layer;
- 1.5-ft. thick protective cover
- geocomposite drainage layer; and
- LDPE geomembrane liner

The LDPE geomembrane offers better flexibility to accommodate differential settlements and strains. However, a PVC or HDPE geomembrane can also be considered. The graded CCR material was assumed to have a permeability no greater than 1 x 10^{-5} cm/s and will function together with the geomembrane liner to limit infiltration through composite action of the cover system.

3.3 Offsite Disposal Considerations

3.3.1 North Carolina Disposal Capacity

According to the NC Solid Waste and Material Management Annual Report FY2012-2013, the remaining Design Capacity (or designed disposal capacity) in NC is approximately 235 million tons which is estimated to provide 32 years of capacity based on an annual generation rate of 7.3 million tons. However, the Annual Report indicates that much of the state's capacity is not available statewide due to limiting factors such as permit conditions and franchise agreements.

A facility's operating capacity is the amount of air space that a given landfill operator is permitted to use. Operating capacity is generally permitted in "phases" that are periodically increased until total design capacity is met or the landfill closes for other reasons. A landfill's total design capacity may never be realized due to additional permit requirements, owner/operator choice, or other reasons. The Annual Report indicated that the remaining operating capacity is 31.9 million tons.

Offsite disposal for all of the CCRs from the Sutton Site would consume roughly 3% and 22% of the state's design and operating capacities, respectively. Furthermore, the estimated CCR amount at Sutton will approximately equal the annual solid waste generation rate used for estimating disposal capacity in years in the NC Solid Waste and Material Management Annual Report FY2012-2013.

3.3.2 Local Traffic Impacts

Offsite disposal options that include on-road trucking have the potential to place a tremendous burden on local transportation routes. Pending regulations in North Carolina may require closure activities to be complete as early as 2019. If permitting activities take as little as one year that would leave only four years to close the CCR ponds. If trucking was conducted during normal working hours, transportation would necessitate over 40 truckloads per hour based on:

- 7.08 million tons of CCR

- 20 tons per load
- 354,000 loads
- 2,000 shift hours per year

Local infrastructure would need to be evaluated to determine the road systems' capacity to handle this additional volume of traffic.

3.3.3 Safety Statistics

General Industry statistics from 2012 indicate that 3.8 nonfatal injuries and 0.14 fatalities occurred per 100 million miles. During the same year, waste management and remediation service personnel reported nationally 11.85 fatalities per 100,000 Full Time Equivalents (FTEs). Offsite disposal options that include on-road trucking need to consider accident and injury rates associated with waste management and remediation service.

3.4 Conceptual Closure Plans

3.4.1 Closure Options

While a discussion of technical evaluations for the selected closure options are presented in **Section 4.2**, a brief discussion of technical considerations that influenced the development of the conceptual closure plans are summarized below.

- As discussed in the **I&A Report** and summarized in **Section 2.8** of this **Feasibility Report**, storm water management systems were sized conceptually to meet the local storm water regulations. Detailed design will be performed as part of the final design.
- Detailed grading and required minimum dike elevation levels to control the cooling pond water levels will be further considered during the final design.
- The design technical specifications for the existing 1984 Pond clay liner indicates that a one-foot thick clay liner, placed in two lifts, and compacted to a minimum density of 95% standard Proctor maximum density was specified. The permeability of the liner was specified to be equal to or less than 10^{-7} cm/s. Further details of the clay liner are presented in **Appendix 3.A1**. No assumption has been made at this time about reusing this liner as part of the liner system for

Option 1.2 where an engineered lined landfill is proposed to be constructed within the footprint of the 1984 Pond after excavating the ponded CCRs.

- As noted in previous sections, the 1971 Borrow Area is located below the 1971 Pond and contains CCR materials to greater depths below the water table. Due to the challenges involved in performing excavations under these conditions, additional in-situ remedial options will need to be considered as well. These remedial options, including the excavation option, are discussed in **Appendix 3.A2**. It is noted that all the pond closure options considered herein have adequate capacity to provide containment for the CCR materials from the 1971 Borrow Area if the excavation option is pursued.

- As noted in previous sections, the LOLA contains CCR and soil mixtures to depths of approximately 2 to 15 ft bgs. Remedial options, including the excavation option, are discussed in **Appendix 3.A3**. It is noted that all the pond closure options considered herein have adequate capacity to provide containment for the CCR and soil mixtures from the LOLA if the excavation option is pursued.

3.4.2 Drawings

WSP Sells, Inc. (WSP) of Cary, North Carolina performed a limited bathymetry survey within the 1984 Pond (secondary pond with water) and near shore areas of the Cooling Pond and discharge canal. The survey map developed by WSP is provided in **Appendix 3.A4.** DEP provided a topographic survey map for the areas within the ponds for the purposes of developing the conceptual closure plans. Geosyntec supplemented the contours for the areas outside the ponds that were not covered by these survey maps by using the North Carolina Department of Transportation (NCDOT) LIDAR survey map dated May 2007 for the purposes of developing the conceptual closure plans. Additional survey work will be performed for selected areas to support the development of the final design for the selected closure option.

As-built drawings for the bottom of CCR grades were not available for the 1971 CCR Pond, while the 1984 CCR Pond area as-built drawings are available. The data sources used to develop the bottom of CRR grades for the 1971 and 1984 Pond are provided in **Appendix 3.A5**. The lateral extents of the 1971 Borrow Area were interpreted based on historical aerial photographs provided in **Appendix 3.A6**. This information was supplemented by the field investigation performed by Geosyntec and presented in Addendum 1 to Report 1 and Addendum 1 to Report 2.

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The conceptual closure plan drawings developed by Geosyntec are presented in **Appendix 3.A7**. These include: (i) overall existing conditions; (ii) interpreted bottom of pond; (iii) interpreted bottom of ash; and (iv) conceptual closure plans for Options 1.1 and 1.2. Detailed design drawings will be developed as part of the final design for the selected closure option.

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4. CLOSURE ALTERNATIVES EVALUATION

4.1 Quantities and Cost Estimates

4.1.1 Quantities

Material quantities were calculated to evaluate constructability for closure options and associated construction costs. The calculations were performed using the conceptual closure plan drawings presented in **Appendix 3.A7** and AutoCAD 2014. AutoCAD creates 3-D surfaces (Triangular Irregular Network surfaces) based on the contours on the grading plans and uses these surfaces to calculate the volume and thickness of each layer. The thicknesses are then graphed as isopachs, which are contours connecting points of equal thickness.

In place CCR top surface, bottom surface, and isopachs are presented in **Appendix 4.A1.** The calculated in place CCR volumes were presented in **Table 2.T1**. The material quantities calculated for the above discussed options are also summarized in **Appendix 4.A1.**

4.1.2 Preliminary Cost Estimates

Preliminary cost estimates for different closure options were developed for the purposes of comparing the options. Assumptions were made to develop these cost estimates at this conceptual evaluation stage, and hence cost estimates will need to be revised once a final design is developed. Details of the cost estimates are presented in **Appendix 4.A2**. Developed cost estimates are summarized in **Table 4.T1**.

4.2 Analysis of Closure Alternatives

4.2.1 Overview

A Kepner-Tregoe (K-T) analysis approach [Kepner and Tregoe, 1981] was used to evaluate the closure options as suggested by DEP. The K-T analysis steps include: (i) situation analysis; (ii) problem analysis; (iii) decision analysis; and (iv) potential problem (or risk) analysis. Since DEP has elected to close the CCR ponds, situation and problem analyses are not performed herein. Decision analysis is performed herein. Potential problem (or risk) analyses will be performed once a closure option is selected. The steps for the decision analysis include: (i) development of evaluation criteria; (ii) assignments of weights for the evaluation criteria; (iii) evaluation of closure options (or alternatives); (iv) scoring of closure options for each evaluation criterion; (v)

calculating the overall score for the closure options; (vi) selecting the best closure option; and (vii) further evaluating the risks and path forward associated with the selected closure option. DEP has performed the following steps for the decision analysis at this time: (i) development of evaluation criteria; (ii) assignments of weights for the evaluation criteria; and (iii) evaluation of closure options (or alternatives). The remaining steps will be performed following finalization of the pending North Carolina legislation.

4.2.2 Evaluation Criteria

The criteria and weights used are provided by DEP to be consistent with closure evaluations being performed for CCR Ponds located at different stations. The evaluation criteria and proposed weights are presented in **Table 4.T2**, and consist of: (i) environmental protection; (ii) regulatory or permitting; (iii) cost; (iv) advantages and disadvantages; (v) long-term costs; (vi) timeframe; and (vii) constructability. Table 4.T3 describes each criterion in more detail.

4.2.3 Analysis of Alternatives

Table 4.T3 presents the analysis of alternatives for the CCR Ponds. This table excludes explicitly addressing the options for the CCR and CCR-soil mixtures in the 1971 Borrow Area and LOLA as several in-situ remedial measures can be considered separately as presented in Appendices 3.A2 and 3.A3, respectively. **Table 4.T4** presents analysis of alternatives for the CCR Ponds by including excavation of the CCR and CCR-soil mixtures in the 1971 Borrow Area and LOLA.

4.2.4 Selection of Best Alternative and Critical Items for Path Forward

DEP proposes to further review the analyzed closure options and select an appropriate alternative for closure following finalization of the pending North Carolina state regulations. Once an alternative is selected, critical items for path forward will be evaluated.

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5. REFERENCES

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TABLES

Table 1.T1.
Summary of Basic Information for Each Pond

Pond	Area (acres)	Maximum Dike Height (ft)	Dike Elevation (ft)	Dike Length (ft)	Upstream Slope	Downstream Slope
1971 Pond	54	24	28	7,000	3H:1V	3H:1V
1984 Pond	82	32	34 (42 - 2006 Interior Containment Area)	10,000	3H:1V	3H:1V

Notes:

1. 100-year flood elevation for the site is 8 ft NAVD88 (North American Vertical Datum of 1988)
2. The hazard ratings for the 1971 and 1984 Ponds are both low.
3. The 1971 and 1984 Ponds are designed for the 12-hour, 50-year and 100-year storms, respectively. The depths for the 50-year and 100-year storms are 9 in. and 10 in., respectively.

Table 2.T1.
Calculated Quantities and Types of CCR Materials for CCR Ponds and Other Areas at Sutton

CCR Area	Area[1] (acres)	Maximum Dike Height (ft)	Volume[2] (million cy)	Type CCR Materials[3]
1971 Pond (top of CCR to ~ El. 10 or "interpreted pond bottom")	54	24	1.6	Bottom ash and fly ash
1971 Borrow Area (~ El. 10 to El. 2)	54	NA	0.3	Bottom ash and fly ash
1971 Borrow Area (El. 2 to ~ El. -36 or interpreted bottom of CCR)	17	NA	1.0	Bottom ash and fly ash
1984 Pond	82	32	2.3	Bottom ash and fly ash
Lay of Land Area (LOLA)	40	NA	0.7	Mostly bottom ash and soil

Notes:

1. Area includes the CCR area only (i.e. potential area for cover installation) and does not include the dikes.
2. Detailed calculations for the quantities of CCR materials at each CCR pond are presented in Section 4 of Report 3.
3. Sutton Plant did not have FGD removal systems, and therefore FGD residuals are not expected within the CCR ponds.
4. NA: Not Applicable

Table 4.T1 - Preliminary Closure Cost Estimates	Total Cost	
	LOLA and 1971 Borrow Area - Excluded	LOLA and 1971 Borrow Area - Included
Option 1.1 - Onsite Greenfield Landfill		
Construction	$ 66,699,541	$ 121,759,811
Engineering, permitting, project management, CQA, and contingency (40%)	$ 26,679,816	$ 48,703,925
Subtotal	$ 93,379,358	$ 170,463,736
Post closure care	$ 4,779,810	$ 4,779,810
Total	$ 98,159,167	$ 175,243,546
Option 1.2 - Onsite Landfill within the Excavated 1984 Pond Footprint		
Construction	$ 60,695,270	$ 107,972,808
Engineering, permitting, project management, CQA, and contingency (40%)	$ 24,278,108	$ 43,189,123
Subtotal	$ 84,973,378	$ 151,161,931
Post closure care	$ 3,478,813	$ 3,478,813
Total	$ 88,452,190	$ 154,640,744
Option 2.1 - Offsite Disposal in a Lined Instate Structural Fill		
Offsite Disposal	$ 179,161,422	$ 248,071,088
Engineering, permitting, project management, CQA, and contingency (40%)	$ 71,664,569	$ 99,228,435
Subtotal	$ 250,825,991	$ 347,299,524
Post closure care	$ 2,124,488	$ 2,124,488
Total	$ 252,950,479	$ 349,424,012
Option 2.2 - Offsite Disposal in an Out of State Landfill		
Offsite Disposal	$ 507,624,029	$ 702,868,084
Engineering, permitting, project management, CQA, and contingency (40%)	$ 203,049,612	$ 281,147,234
Subtotal	$ 710,673,641	$ 984,015,317
Post closure care	$ 2,124,488	$ 2,124,488
Total	$ 712,798,128	$ 986,139,805
Option 2.3 - Offsite Disposal in an Instate Landfill		
Offsite Disposal	$ 447,903,555	$ 620,177,721
Engineering, permitting, project management, CQA, and contingency (40%)	$ 179,161,422	$ 248,071,088
Subtotal	$ 627,064,977	$ 868,248,809
Post closure care	$ 2,124,488	$ 2,124,488
Total	$ 629,189,465	$ 870,373,297

Table 4.T2.
Evaluation Criteria for Closure Options

No.	Criteria	Weight	Description
1	Environmental Protection	10	• protection of human health and environment • ability to meet standards at the compliance boundary • does source remain on-site • position of source relative to groundwater (above/below) • neighbor and community concerns • potential long-term risk
2	Regulatory / Permitting	8	• what is the likelihood of regulatory approval (dams, groundwater, surface water): likely/unlikely; low-medium-high • what are potential regulatory challenges and considerations (i.e. ash below groundwater table) • Dam Safety NCDENR-DWR- APS Streams/wetlands • what are potential influence of pending regulations (could they require something different in the future)
3	Cost	9	• capital costs for construction, engineering/permitting
4	Advantages / Disadvantages	5	• acknowledge advantages and disadvantages of each option • position relative to rivers • is there flexibility for future reuse • effect on neighbors • site-wide stormwater management and flood plains • is there a precedent set with respect to other sites
5	Long-Term Costs	4	• Costs for operations and maintenance during post-closure care period: site maintenance; groundwater monitoring/reporting
6	Timeframe	4	• estimated schedule (design/permitting and construction) • consider the sequence of activities and timeline through to closure • schedule complexity and flexibility
7	Constructability	2	• provide opinions about the constructability and the degree of difficulty for construction

Notes:

1. The criteria and weights used herein are provided by DEP to be consistent with closure evaluations being performed for CCR Ponds located at different stations.

Table 4.T3.
Analysis of Alternatives for the CCR Ponds (1971 and 1984) at Sutton Excluding the 1971 Borrow Area and LOLA (Alternate Insitu Remedial Measures to be Developed for These).

Closure Option	Details	Environmental Protection	Regulatory / Permitting	Cost	Advantages	Disadvantages	Long-Term Costs	Timeframe	Constructability
Option 1.1 - Onsite Greenfield Landfill	Construct onsite greenfield landfill Relocate 1971 and 1984 pond ash Place ash in landfill and cap	Source removal and lined disposal	Dam safety: likely approval. Aquifer protection: likely approval Water bodies and wetlands: not an issue Waste Management: Will need to go through landfill siting and permitting.	$93M	Consolidates ash to a smaller footprint Lined disposal	Utilizes greenfield land for ash disposal purposes	Cost over 30 years = $4.8M	Design & permit = 24 months Construction = 40 months Total = 64 months Post-closure = 30 years monitoring and O&M	CCR excavation and onsite landfill construction includes major construction effort
Option 1.2 – Onsite Landfill within the Excavated 1984 Pond Footprint	Relocate ash and manage in stockpile within pond footprints Construct onsite landfill within the excavated 1984 Pond footprint Place ash in landfill and cap	Source removal and lined disposal	Dam safety: likely approval. Aquifer protection: likely approval Water bodies and wetlands: not an issue Waste Management: Will need to go through landfill siting and permitting.	$85M	Consolidates ash to a smaller footprint Lined disposal Does not utilize greenfield land for ash disposal purposes	Staged construction may increase health and safety (construction worker) risk Ash remains closer to cooling pond	Cost over 30 years = $3.5M	Design & permit = 24 months Construction = 48 months Total = 72 months Post-closure = 30 years monitoring and O&M	CCR excavation and onsite landfill construction includes major construction effort and staging needs
Option 2.1 – Offsite Disposal in a Lined Instate Structural Fill	Relocate 1971 and 1984 pond ash Transport by rail Use for clay mine reclamation (in state confidential location) – lined and capped	Subtitle D Design Liner Rail Transportation to minimize hauling impacts	DORS permit – notify state Subtitle D liner design should meet state expectations Mine Reclamation not in current DORS permit	$251M	Mine Reclamation is a beneficial reuse of CCR material Off-site option allows for possible reuse of the Sutton site Rail haul minimize neighbor impacts with traffic	Rail haul may pose risk of accidental spills	Cost over 30 years = $2.1M	55 months	On-site excavation work, but other construction owned by selected vendor

Table 4.T3.
Analysis of Alternatives for the CCR Ponds (1971 and 1984) at Sutton Excluding the 1971 Borrow Area and LOLA (Alternate Insitu Remedial Measures to be Developed for These).

Closure Option	Details	Environmental Protection	Regulatory / Permitting	Cost	Advantages	Disadvantages	Long-Term Costs	Timeframe	Constructability
Option 2.2 – Offsite Disposal in an Out of State Landfill	Relocate 1971 and 1984 pond ash Transport by rail Place in confidential landfill (out of state)	Subtitle D Design Liner – Monofill Cell Rail Transportation to minimize hauling impacts	Currently permitted to receive CCR All site capacity has permit to construct	$710M	Off-site option allows for possible reuse of the Sutton site Rail haul minimize neighbor impacts with traffic	Utilizes greenfield land for ash disposal purposes Rail haul may pose risk of accidental spills	Cost over 30 years = $2.1M	55 months	On-site excavation work, but other construction owned by selected vendor
Option 2.3 – Offsite Disposal in an Instate Landfill	Relocate 1971 and 1984 pond ash Transport by truck Place in confidential MSW landfill (in state)	Subtitle D Design Liner Trucking option causing impact to neighbors and communities	Currently permitted to receive CCR Would need to complete permitting for new cells	$627M	Off-site option allows for possible reuse of the Sutton site	Utilizes greenfield land for ash disposal purposes Trucking – Health and Safety Risk	Cost over 30 years = $2.1M	55 months	On-site excavation work, but other construction owned by selected vendor

Table 4.T4.
Analysis of Alternatives for the CCR Ponds (1971 and 1984) at Sutton along with the 1971 Borrow Area and LOLA.

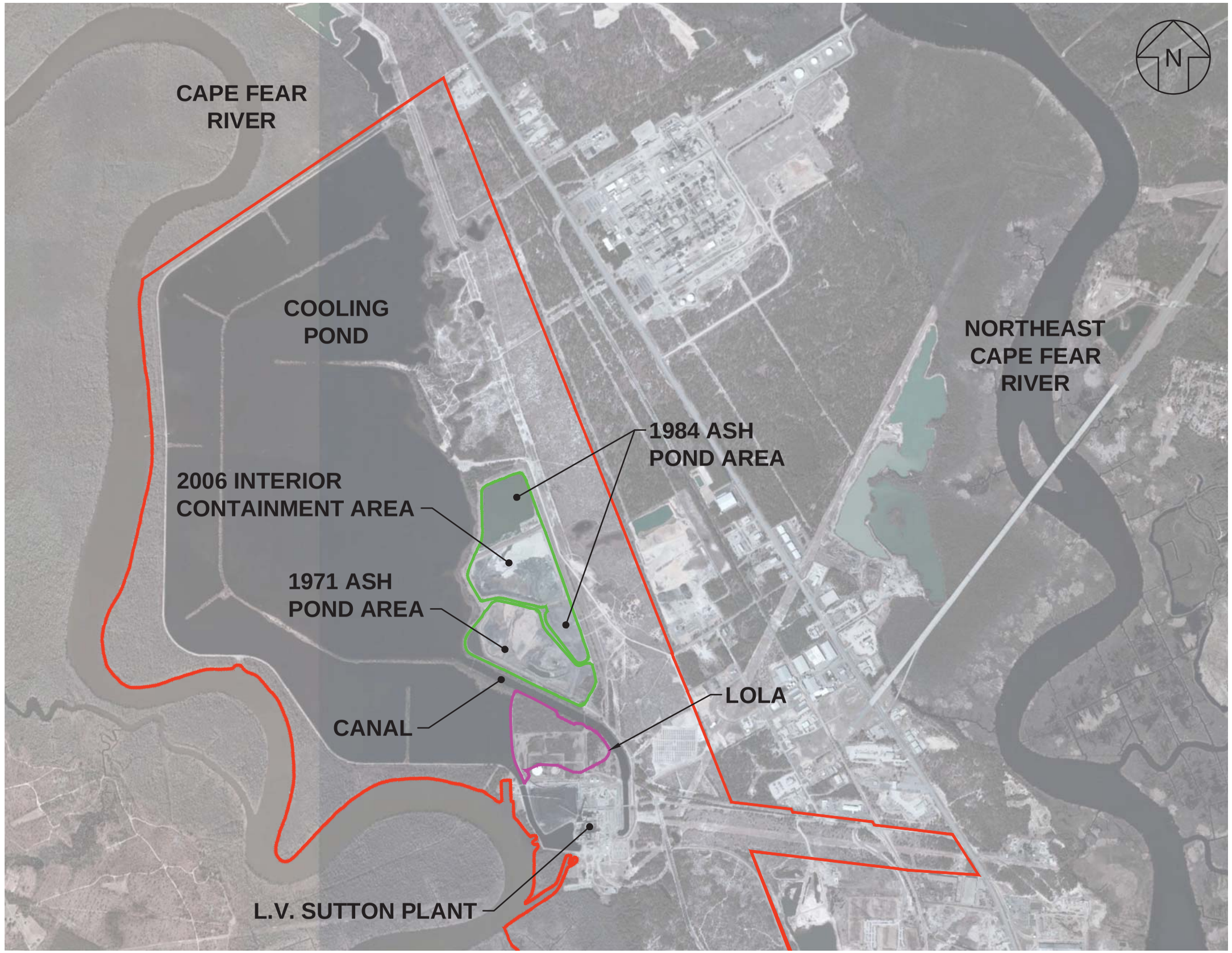
Closure Option	Details	Environmental Protection	Regulatory / Permitting	Cost	Advantages	Disadvantages	Long-Term Costs	Timeframe	Constructability
Option 1.1 - Onsite Greenfield Landfill	Construct onsite greenfield landfill Relocate 1971 and 1984 pond ash Relocate 1971 Borrow Area and LOLA ash and ash-soil mixtures Place ash in landfill and cap	Source removal and lined disposal	Dam safety: likely approval. Aquifer protection: likely approval Water bodies and wetlands: not an issue Waste Management: Will need to go through landfill siting and permitting.	$170M	Consolidates ash to a smaller footprint Lined disposal	Utilizes greenfield land for ash disposal purposes	Cost over 30 years = $4.8M	Design & permit = 36 months Construction = 60 months Total = 96 months Post-closure = 30 years monitoring and O&M	CCR excavation and onsite landfill construction includes major construction effort. Additional major challenges associates with excavating the 1971 Borrow Area ash.
Option 1.2 – Onsite Landfill within the Excavated 1984 Pond Footprint	Relocate ash and manage in stockpile within pond footprints Relocate 1971 Borrow Area and LOLA ash and ash-soil mixtures Construct onsite landfill within the excavated 1984 Pond footprint Place ash in landfill and cap	Source removal and lined disposal	Dam safety: likely approval. Aquifer protection: likely approval Water bodies and wetlands: not an issue (pending status of cooling pond and 300 ft buffer requirement) Waste Management: Will need to go through landfill siting and permitting.	$151M	Consolidates ash to a smaller footprint Lined disposal Does not utilize greenfield land for ash disposal purposes	Staged construction may increase health and safety (construction worker) risk Ash remains closer to cooling pond	Cost over 30 years = $3.5M	Design & permit = 36 months Construction = 72 months Total = 108 months Post-closure = 30 years monitoring and O&M	CCR excavation and onsite landfill construction includes major construction effort and staging needs Construction near deep excavation Additional major challenges associates with excavating the 1971 Borrow Area ash.
Option 2.1 – Offsite Disposal in a Lined Instate Structural Fill	Relocate 1971 and 1984 pond ash Relocate 1971 Borrow Area and LOLA ash and ash-soil mixtures Transport by rail Use for clay mine reclamation (in state confidential location) – lined and capped	Subtitle D Design Liner Rail transportation to minimize hauling impacts	DORS permit – notify state Subtitle D liner design should meet state expectations Mine Reclamation not in current DORS permit	$347M	Mine Reclamation is a beneficial reuse of CCR material Off-site option allows for possible reuse of the Sutton site Rail haul minimize neighbor impacts with traffic	Rail haul may pose risk of accidental spills	Cost over 30 years = $2.1M	75 months	On-site excavation work, but other construction owned by selected vendor Additional major challenges associates with excavating the 1971 Borrow Area ash.

Table 4.T4.
Analysis of Alternatives for the CCR Ponds (1971 and 1984) at Sutton along with the 1971 Borrow Area and LOLA.

Closure Option	Details	Environmental Protection	Regulatory / Permitting	Cost	Advantages	Disadvantages	Long-Term Costs	Timeframe	Constructability
Option 2.2 – Offsite Disposal in an Out of State Landfill	Relocate 1971 and 1984 pond ash Relocate 1971 Borrow Area and LOLA ash and ash-soil mixtures Transport by rail Place in confidential landfill (out of state)	Subtitle D Design Liner – Monofill Cell Rail Transportation to minimize hauling impacts	Currently permitted to receive CCR All site capacity has permit to construct	$984M	Off-site option allows for possible reuse of the Sutton site Rail haul minimize neighbor impacts with traffic	Utilizes greenfield land for ash disposal purposes Rail haul may pose risk of accidental spills	Cost over 30 years = $2.1M	75 months	On-site excavation work, but other construction owned by selected vendor. Additional major challenges associates with excavating the 1971 Borrow Area ash.
Option 2.3 – Offsite Disposal in an Instate Landfill	Relocate 1971 and 1984 pond ash Relocate 1971 Borrow Area and LOLA ash and ash-soil mixtures Transport by truck Place in confidential MSW landfill (in state)	Subtitle D Design Liner Trucking option causing impact to neighbors and communities	Currently permitted to receive CCR Would need to complete permitting for new cells	$868M	Off-site option allows for possible reuse of the Sutton site	Utilizes greenfield land for ash disposal purposes Trucking – Health and Safety Risk	Cost over 30 years = $2.1M	75 months	On-site excavation work, but other construction owned by selected vendor Additional major challenges associates with excavating the 1971 Borrow Area ash.

FIGURE

DUKE L.V. SUTTON
STEAM ELECTRIC PLANT
WILMINGTON, NORTH CAROLINA



LEGEND

- APPROXIMATE POND LOCATION
- LOLA
- APPROXIMATE PROPERTY BOUNDARY

SOURCES: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

VICINITY MAP

NOT TO SCALE

NOTES:

1. HORIZONTAL CONTROL REPRESENTED ON THIS FIGURE IS BASED ON NORTH CAROLINA STATE PLANE COORDINATE SYSTEM (NAD83 2011).
2. VERTICAL CONTROL REPRESENTED ON THIS FIGURE IS BASED ON NORTH CAROLINA STATE PLANE COORDINATE SYSTEM (NAVD88).
3. 2013 ESRI AERIAL IMAGERY SOURCE: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.
4. PROPERTY LINE SOURCE: NORTH CAROLINA LOCAL GIS DATA ARCHIVE, NEW HANOVER COUNTY, FTP WEBSITE: ftp://ftp.nhcgov.com/outbound/gisdata/shapes/.

0 2000' 4000'

SCALE IN FEET

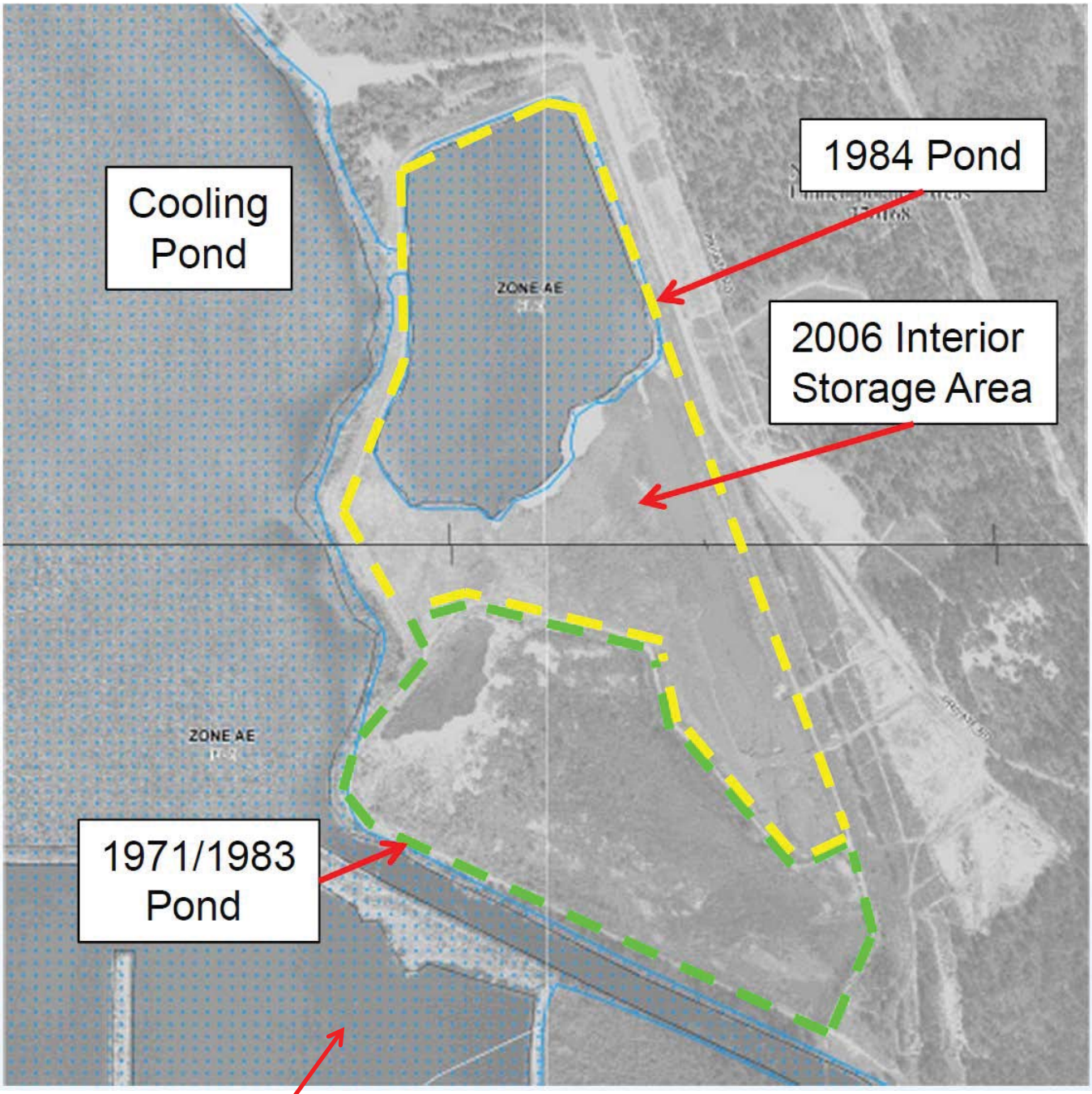
Geosyntec consultants

PROJECT NO: GC5592	AUGUST 2014	FIGURE 1.F1

M:\D\DUKE ENERGY\DUKE-LV SUTTON-GC5592\FIGURES\5592F028 SUTTON OVERALL SITE

APPENDIX 2.A1

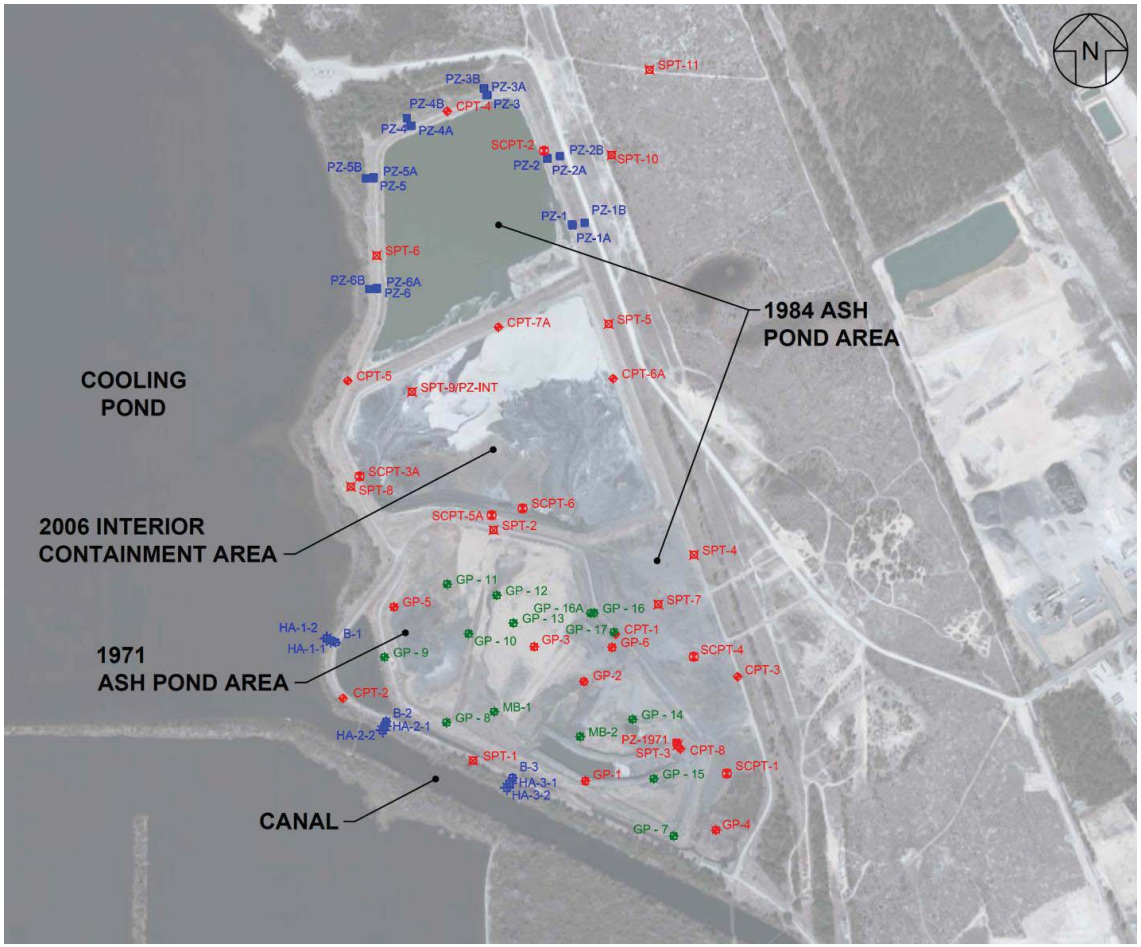
Summary of Key Figures from the Data Report and I & A Report



Flood Insurance Rate Map (FEMA, 2006)

L.V. Sutton Plant

Geosyntec Consultants of NC, PC NC License No.: C-3500	Project No. GC5592 August 2014	Figure 1



LEGEND

CPT-1	GEOSYNTEC CONE PENETRATION TEST (MAY 2014)
GP-1	GEOSYNTEC GEOPROBE (MAY 2014)
GP-7	GEOSYNTEC GEOPROBE (JUNE-JULY 2014)
MB-1	GEOSYNTEC MARSH BORINGS (JUNE-JULY 2014)
PZ-1971	GEOSYNTEC PIEZOMETER (MAY 2014)
SCPT-1	GEOSYNTEC SEISMIC CONE PENETRATION TEST (MAY 2014)
SPT-1	GEOSYNTEC STANDARD PENETRATION TEST (MAY 2014)
HA-1-1	HISTORICAL HAND-AUGER
PZ-1	HISTORICAL PIEZOMETER
B-1	HISTORICAL STANDARD PENETRATION TEST

NOTES:

1. B-SERIES, HA-SERIES, AND PZ-B-SERIES POINTS ARE SHOWN AT APPROXIMATE LOCATIONS.
2. POST-FIX 'A' FOR GEOSYNTEC INVESTIGATION POINTS INDICATES A POINT ON THE DIKE OF 2006 INTERIOR CONTAINMENT AREA.
3. THE LOCATIONS OF THE GEOSYNTEC BORINGS WERE SURVEYED BY WSP SELLS, INC., IN MAY AND JULY 2014.

0 600' 1200'

SCALE IN FEET

Path:

Historical and Recent Geotechnical Boring Locations

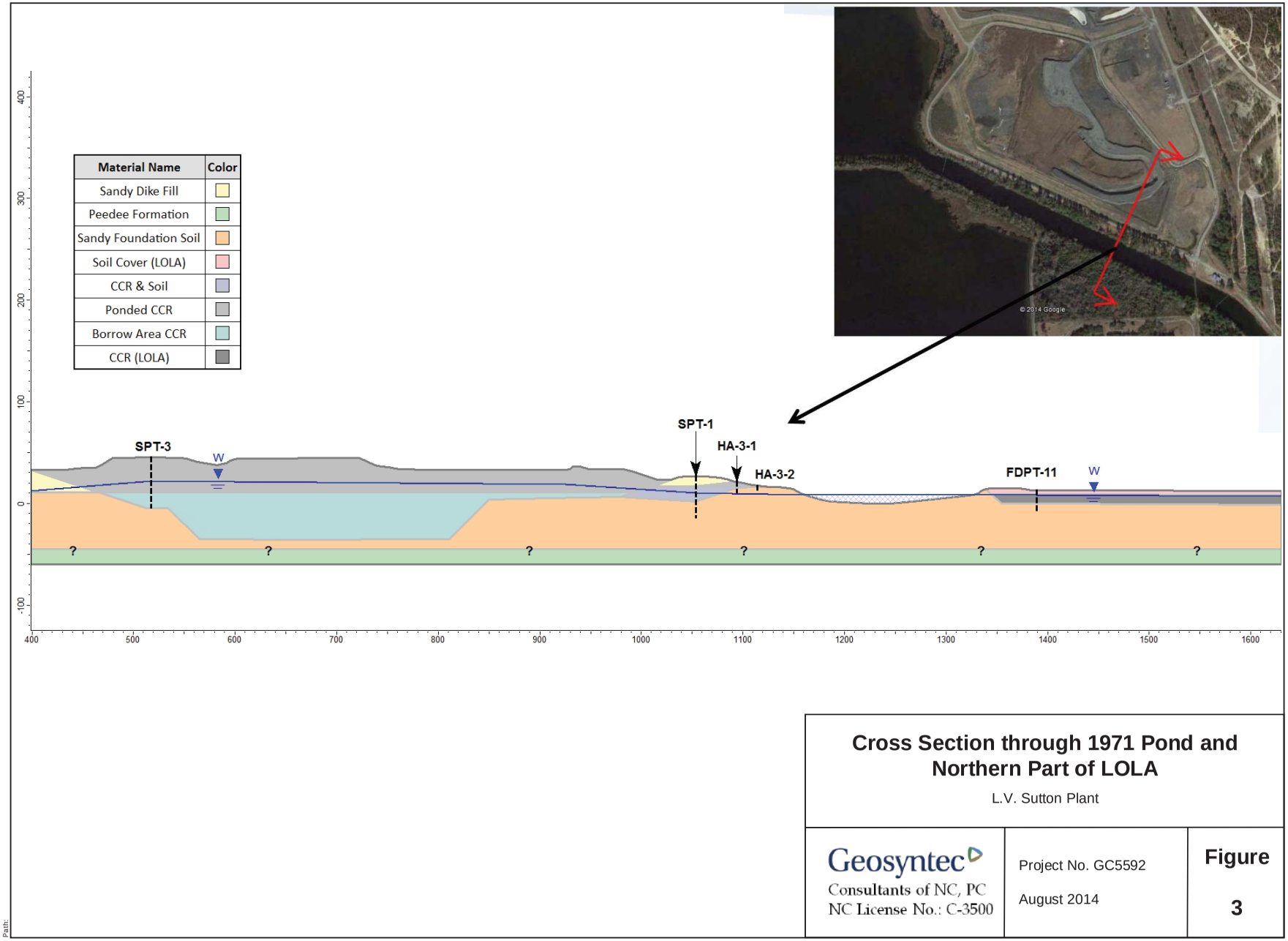
L.V. Sutton Plant

Geosyntec
Consultants of NC, PC
NC License No.: C-3500

Project No. GC5592

September 2014

Figure 2

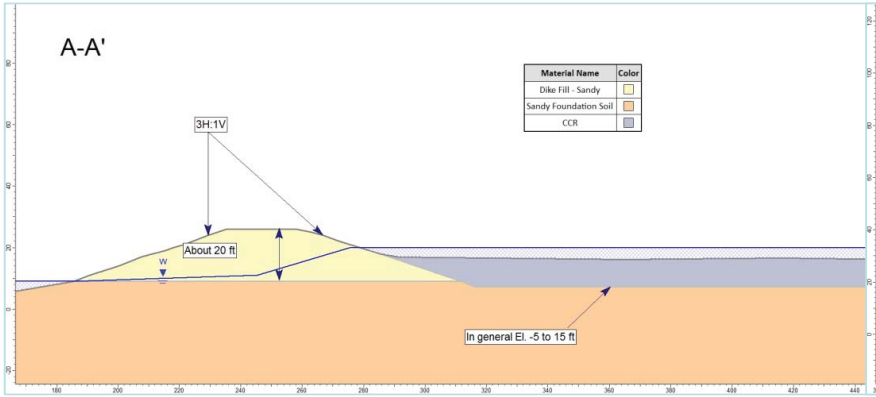


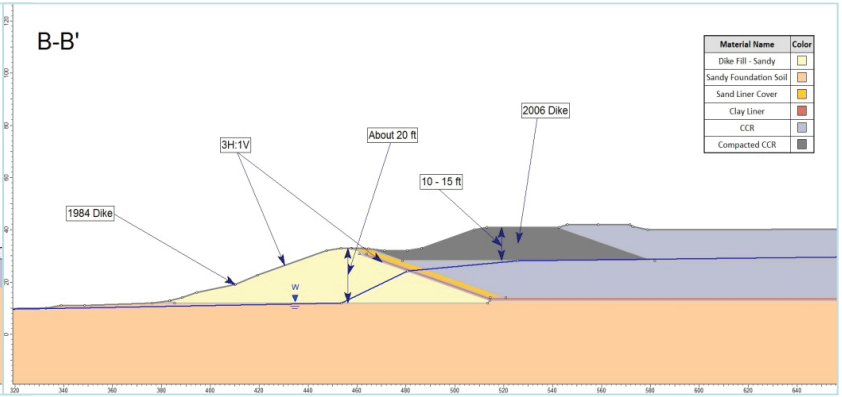
Cross Section through 1971 Pond and Northern Part of LOLA

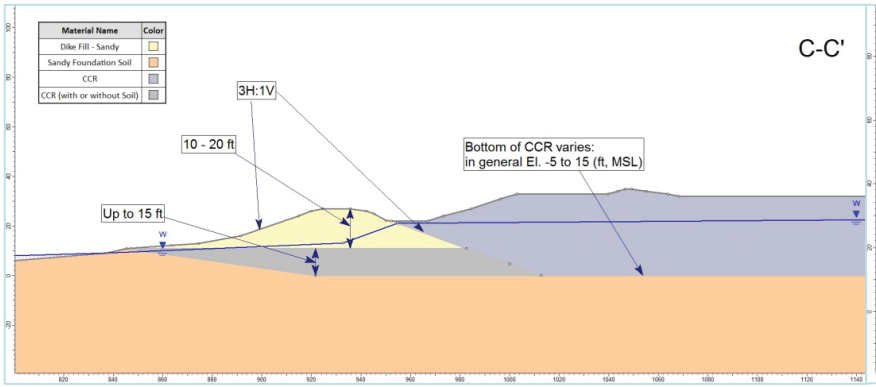
L.V. Sutton Plant

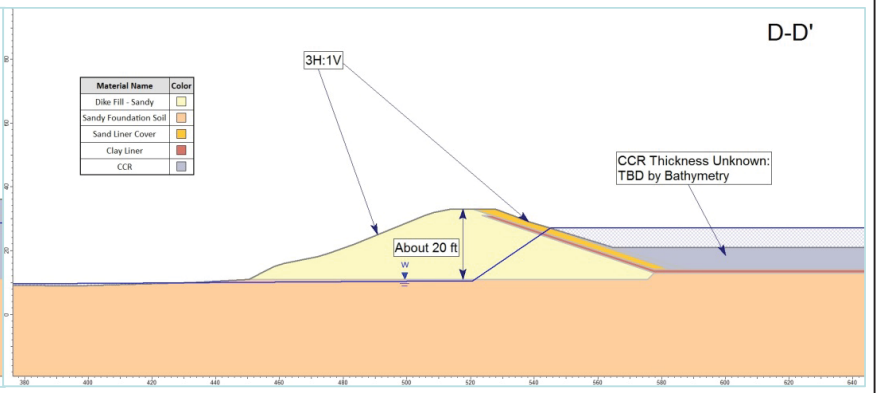
Geosyntec Consultants of NC, PC NC License No.: C-3500	Project No. GC5592 August 2014	Figure 3

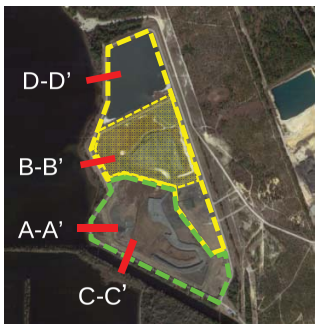
Path:









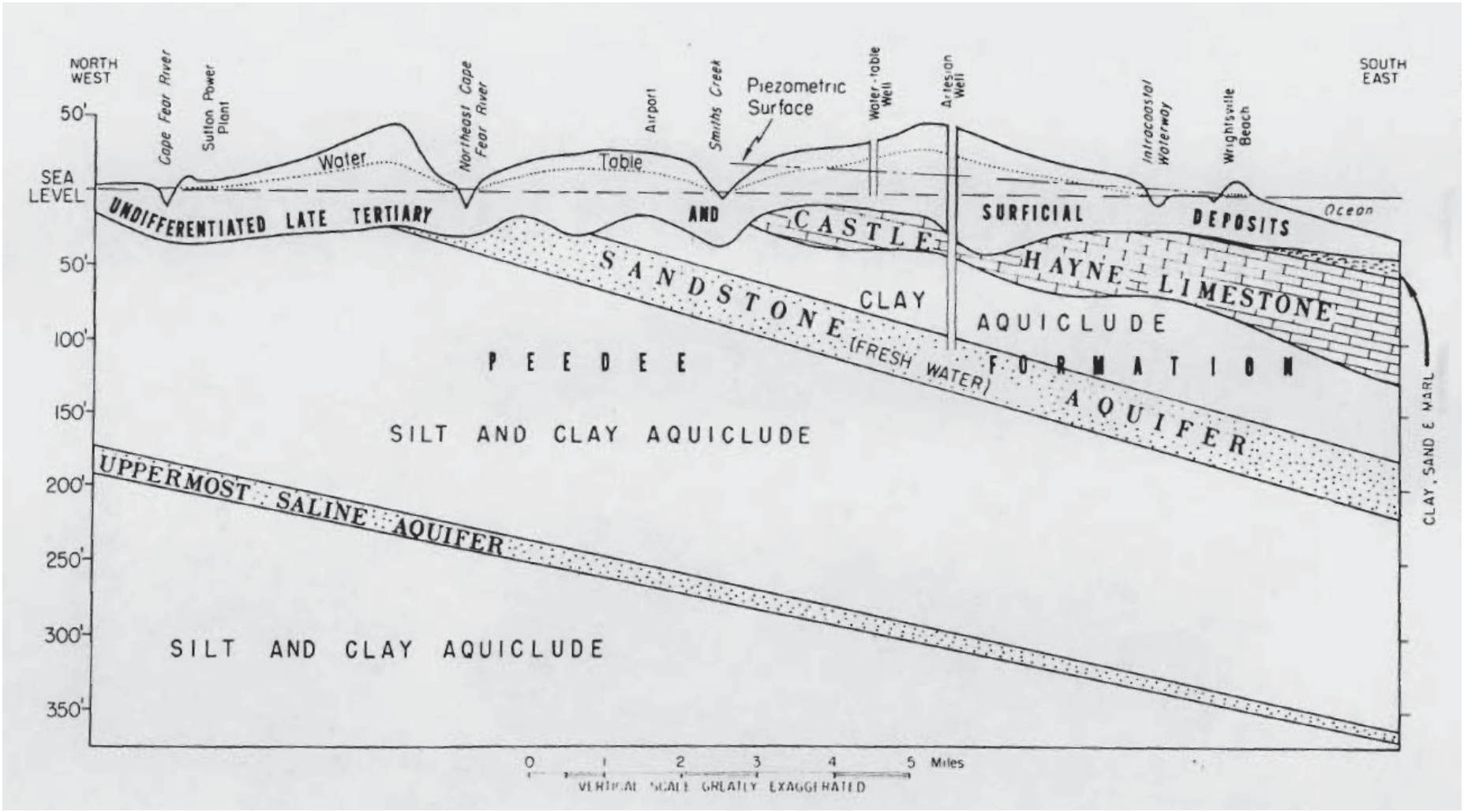


Select Cross Sections within 1971 and 1984 Ponds

L.V. Sutton Plant

Geosyntec Consultants of NC, PC NC License No.: C-3500	Project No. GC5592 August 2014	**Figure** **4**

Path:



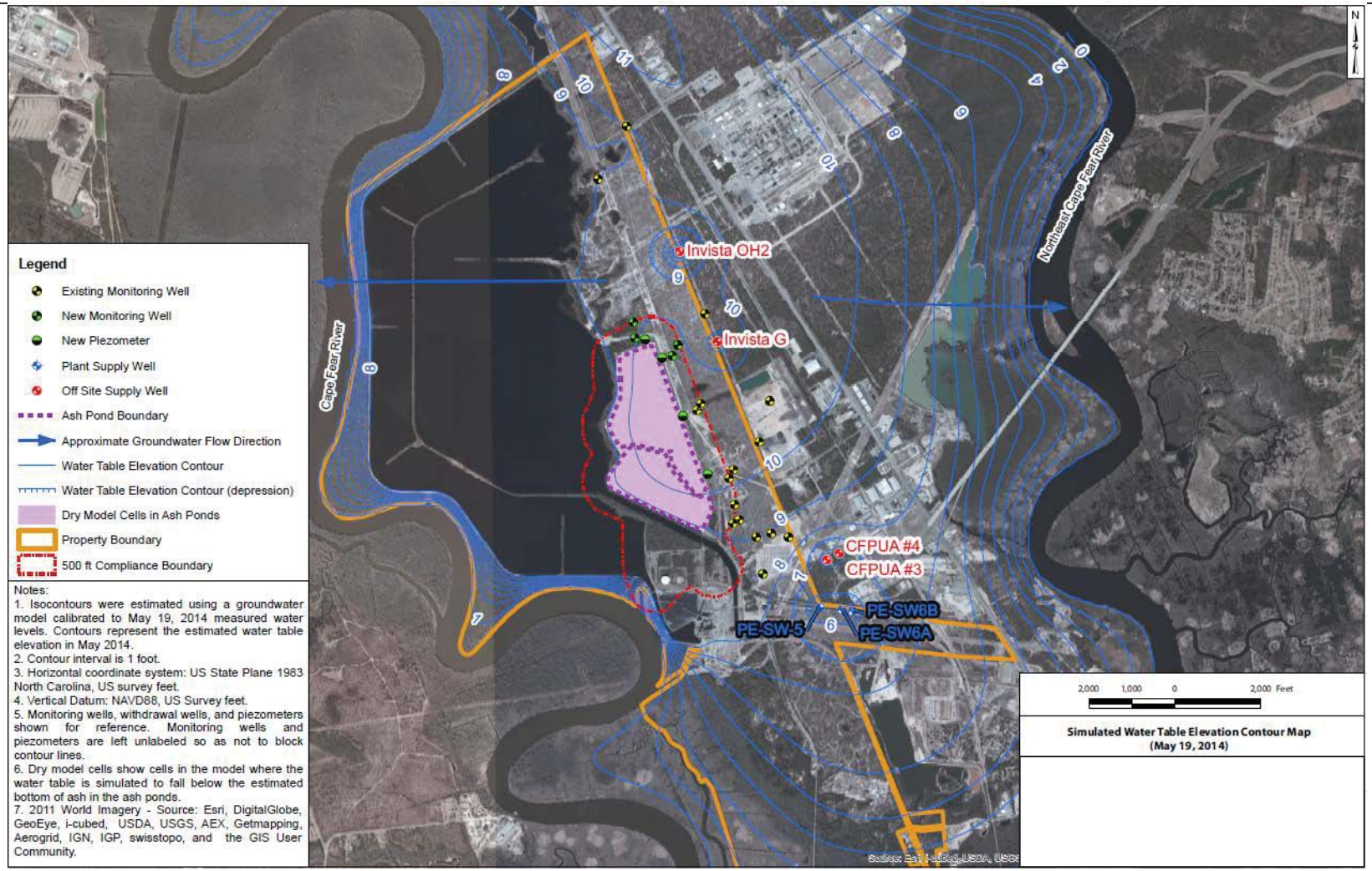
From Bain [1970]. Geology and Groundwater Resources of New Hanover County, North Carolina. Groundwater Bulletin No. 17, United States Geological Survey, p. 90.

Regional Geologic Cross Sections

L.V. Sutton Plant

Geosyntec Consultants of NC, PC NC License No.: C-3500	Project No. GC5592 August 2014	**Figure** **5**

Path:

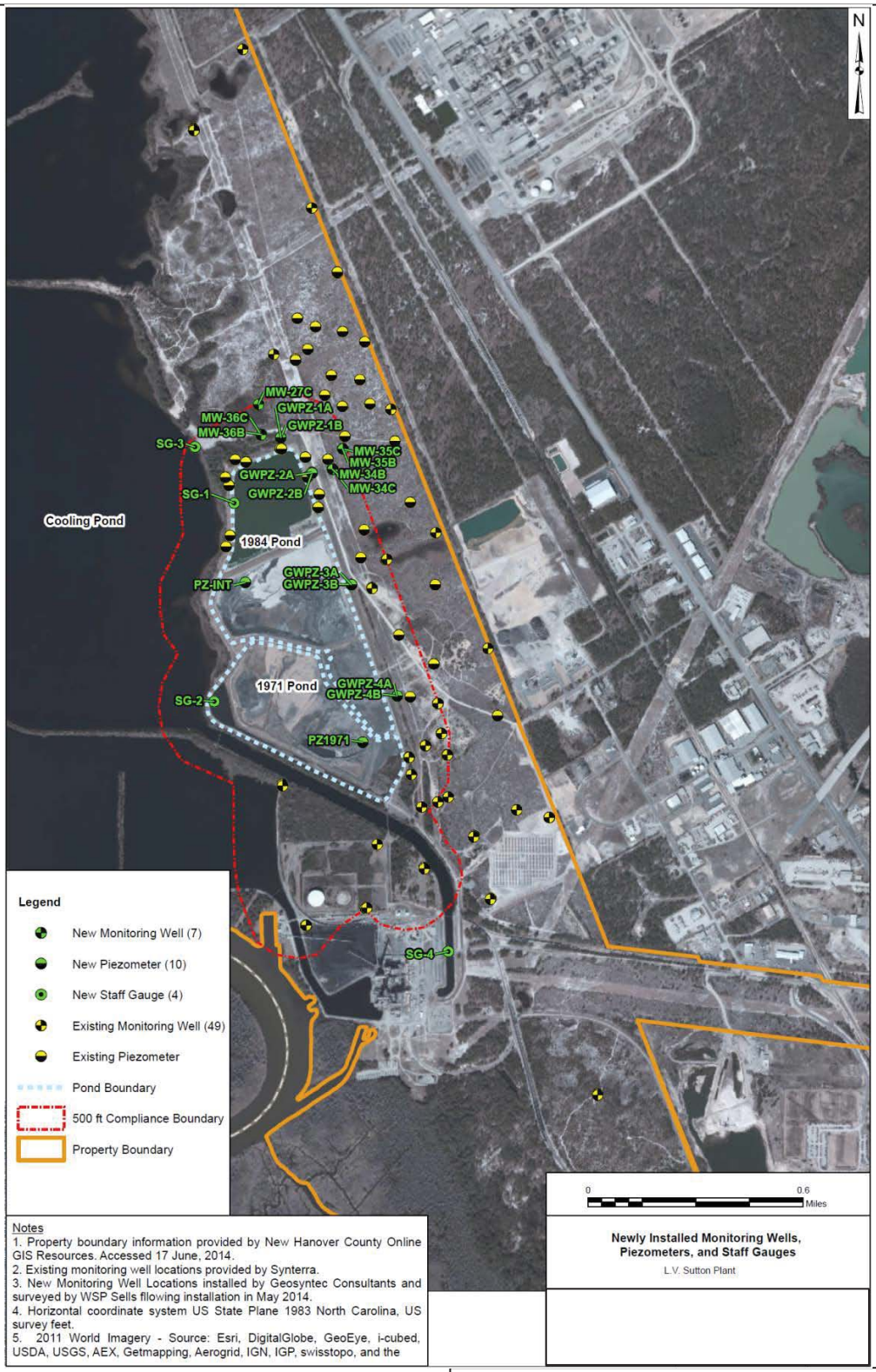


Simulated Water Table Elevations

L.V. Sutton Plant

Geosyntec Consultants of NC, PC NC License No.: C-3500	Project No. GC5592 August 2014	Figure 6

Path:



Newly Installed and Existing Wells, Piezometers and Staff Gauges

L.V. Sutton Plant

Geosyntec Consultants of NC, PC NC License No.: C-3500	Project No. GC5592 August 2014	Figure 7

Path:

500-ft Compliance Boundary

CCR Area Boundary

Note:
Concentrations of constituents of interest (COIs) are evaluated in the context of background conditions and regulatory limits in the **Interpretation and Analysis (I & A) Report**.

Arsenic in Select Wells and Piezometers

L.V. Sutton Plant

Geosyntec
Consultants of NC, PC
NC License No.: C-3500

Project No. GC5592

August 2014

Figure 8

Path:

500-ft Compliance Boundary

CCR Area Boundary

Note:
Concentrations of constituents of interest (COIs) are evaluated in the context of background conditions and regulatory limits in the **Interpretation and Analysis (I & A) Report**.

Boron in Select Wells and Piezometers

L.V. Sutton Plant

Geosyntec
Consultants of NC, PC
NC License No.: C-3500

Project No. GC5592

August 2014

Figure 9

Path:

500-ft Compliance Boundary

CCR Area Boundary

Note:
Concentrations of constituents of interest (COIs) are evaluated in the context of background conditions and regulatory limits in the **Interpretation and Analysis (I & A) Report**.

Path:

Selenium in Select Wells and Piezometers

L.V. Sutton Plant

Geosyntec
Consultants of NC, PC
NC License No.: C-3500

Project No. GC5592

August 2014

Figure 10

Scoring for Evaluation of Closure Options
Closure Options Evaluation Worksheet
Ash Basin Closure - Master Programmatic Document
Duke Energy

Site Name: Weatherspoon
Date: July 29, 2016

1	= Option-Specific User Input
1	= Calculated Value

Placeholder values have been entered in "User Input" cells to prevent division by zero error text in calculated score cells.

Threshold Criteria: All closure options must comply with the following threshold criteria based on Duke Energy Guiding Principals for Ash Basin Closure
1. Provide continued geotechnical stability meeting appropriate safety factors under applicable loading conditions
2. Provide flow capacity and erosion resistance during design storm and flooding conditions
3. Effectively mitigate groundwater impacts (in conjunction with GW remediation where present)
4. Comply with applicable state and federal regulations (e.g. North Carolina Coal Ash Management Act)

Option	Description
1	Closure by Removal - Off-site Landfill or Structural Fill with Rail Haul
2	Closure by Removal - On-site Landfill
3	
4	
5	
A	Closure in Place (not allowed in North Carolina Coal Ash Management Act, thus did not meet threshold criteria)
B	

Note: Options that did not meet threshold criteria should be listed in the Options Summary table above for completeness

Environmental Protection and Impacts	**Weight:**	**30%**		**User Input**							**Calculated or User Selected Score**						
Criterion	**Scoring System**	**Required Input**	**Units**	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**	**Value that Scores 10**	**Value that Scores 0**	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**	**Criterion Weight**	**Contribution to Total Score**
Modeled surface water impact	Refer to EM Sub-Scoring Sheet	This Area Not Used For Interpretation of Environmental Modeling Results									10	10				21%	6.3%
Modeled off-site impact	Refer to EM Sub-Scoring Sheet	This Area Not Used For Interpretation of Environmental Modeling Results									10	10				43%	12.9%
Groundwater impact beyond the waste boundary	Refer to EM Sub-Scoring Sheet	This Area Not Used For Interpretation of Environmental Modeling Results									10	10				21%	6.3%
Air emissions off-site (based on miles hauled)	Interpolation. Zero miles scores 10.	Total rail miles	Miles	65	0	65	65	65	0	65	0	10	0	0	0	5%	1.5%
Air emissions on-site (based on gallons of fuel consumed) from closure implementation	Interpolation. Zero gallons scores 10.	Total cut and fill on site	Cu Yds	20	29	29	29	29	0	29	3	0	0	0	0	5%	1.5%
Avoidance of greenfield disturbance	Interpolation. Zero acres scores 10.	Disturbed acres of greenfield	Acres	0	0	10	10	10	0	10	10	10	0	0	0	5%	1.5%
Weighted Totals (Contribution to Total Score)											**2.7**	**2.9**	**0.0**	**0.0**	**0.0**		

Cost	**Weight:**	**35%**		**User Input**							**Calculated or User Selected Score**						
Criterion	**Scoring System**	**Required Input**	**Units**	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**	**Value that Scores 10**	**Value that Scores 0**	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**	**Criterion Weight**	**Contribution to Total Score**
Closure Cost	Interpolation. Min value scores 10. Max value scores 0.	Closure Cost	USD	$101,000,000	$75,000,000				$ 75,000,000	$ 101,000,000	0	10	0	0	0	80%	28.0%
Operation, Maintenance and Monitoring Cost		OM&M Cost	USD	$750,000	$3,500,000				$ 750,000	$ 3,500,000	10	0	0	0	0	20%	7.0%
Weighted Totals (Contribution to Total Score)											**0.7**	**2.8**	**0.0**	**0.0**	**0.0**		

Schedule	**Weight:**	**15%**		**User Input**							**Calculated or User Selected Score**						
Criterion	**Scoring System**	**Required Input**	**Units**	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**	**Value that Scores 10**	**Value that Scores 0**	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**	**Criterion Weight**	**Contribution to Total Score**
Initiation Time	Interpolation Minimum value scores 10	Time to move first ash	Months	24	30	36			24	36	10	5	0	0	0	30%	4.5%
Construction Duration	Interpolation Minimum value scores 10	Estimated durations	Months	24	48	72			24	72	10	5	0	0	0	70%	10.5%
Weighted Totals (Contribution to Total Score)											**1.5**	**0.8**	**0.0**	**0.0**	**0.0**		

Scoring for Evaluation of Closure Options
Closure Options Evaluation Worksheet
Ash Basin Closure - Master Programmatic Document
Duke Energy

Site Name: Weatherspoon
Date: July 29, 2016

1	= Option-Specific User Input
1	= Calculated Value

Placeholder values have been entered in "User Input" cells to prevent division by zero error text in calculated score cells.

Regional Factors	Weight:	15%		User Input					Value that Scores 10	Value that Scores 0	Calculated or User Selected Score					Criterion	Contribution to
Criterion	Scoring System	Required Input	Units	Option 1	Option 2	Option 3	Option 4	Option 5			Option 1	Option 2	Option 3	Option 4	Option 5	Weight	Total Score
Plan or potential for beneficial reuse of site	Subjective	Not Used For Subjective Scoring									10	5	0	0	0	5%	0.75%
Imported soil needs	Interpolation Min value scores 10 Max value scores 0	Soil Imported	CY	0	100				0	100	10	0	0	0	0	5%	0.75%
Beneficial reuse of CCR	Interpolation. Maximum value scores 10.	Fraction Used	None	1	1				1	0	10	10	0	0	0	15%	2.25%
Transportation impact (based on miles hauled)	Interpolation Min value scores 10 Max value scores 0	Total rail miles	Miles	65	0	65	65	65	0	65	0	10	0	0	0	65%	9.75%
Noise impact due to on-site activity (based on proximity of neighbors to on-site work areas)	Subjective 0 to 10	Not Used For Subjective Scoring									10	10				5%	0.75%
View impact (based on final height of storage facility and land uses within viewshed)	Subjective 0 to 10										10	0				5%	0.75%
Weighted Totals (Contribution to Total Score)											**0.5**	**1.3**	**0.0**	**0.0**	**0.0**		

Constructability	Weight:	5%		User Input					Value that Scores 10	Value that Scores 0	Calculated or User Selected Score						
Criterion	Scoring System	Required Input	Units	Option 1	Option 2	Option 3	Option 4	Option 5			Option 1	Option 2	Option 3	Option 4	Option 5		
Consider stormwater management, geotechnical, and dewatering	Subjective 0 to 10: 10 is the easiest while 0 is the riskiest	Not Used For Subjective Scoring									10	5	0	0	0	100%	5.0%
Weighted Totals (Contribution to Total Score)											**0.5**	**0.3**	**0.0**	**0.0**	**0.0**		
Total Score For Each Option (On a Scale of 0 to 10)											**6.0**	**8.0**	**0.0**	**0.0**	**0.0**		

Exhibit 8.1: Discovery Analysis -- Closure Options				
Table 8.1.2: Explanation of CCR Remediaiton and Closure Options				
Option 1: Hybrid Closure	**Option 2: Closure-In-Place**	**Option 3A: Closure-By-Removal #1 (Existing On-Site Landfill)**	**Option 3B: Closure-By-Removal #2 (Existing & New On-Site Landfills)**	**Option 4: Closure-By-Removal #3 (Off-Site Third Party Landfill)**
Dewater ash basin.	Dewater ash basin.	Dewater ash basin.	Dewater ash basin.	Dewater ash basin.
Provide dust and erosion control.	Reroute storm water sluice lines from existing coal plant and decommission CCR slurry lines.	Provide dust and erosion control.	Provide dust and erosion control.	Excavate and removal of ash to off-site landfill.
Demo and grout in place piezometers and water wells within the basin boundary limits.	Leave the CCR material within the Ash Basin(s).	Demo and grout in place piezometers and water wells within the basin boundary limits.	Demo and grout in place piezometers and water wells within the basin boundary limits.	Breach dam(s) between the basins.
Demo pump house/weir/wooden bridge	Grade and level ash remaining in Ash Basin(s).	Excavate top soil and substrate to create void for on-site landfill.	Excavate top soil and substrate to create void for on-site landfill.	Design and construct haul road(s).
Demo forebay dam and concrete bridge	Cap with an infiltration barrier cap system meeting the requirements of the Federal CCR Rule and CAMA.	Expand leachlate collection system.	Haul in additional soil and clay to line and cover the landfill.	Collect and dispose of leachate.
Cut dam down and push into the basin as fill material	Reroute storm water sluice lines from existing coal plant.	Expand bottom and sidewall liner.	Install leachate collection system.	Supply and install truck scales.
Excavate and remove riprap and store for later use	Grade area once ash removal is completed.	Remove all CCR from CCR basin(s).	Install bottom and sidewall liner.	Supply and install truck wash system.
Excavate and grade basin for drainage.	Provide and install erosion control measures to prevent run-run and run-off of stormwater.	Allow CCR to drain before placing in new on-site landfill.	Remove all CCR from CCR basin(s).	Remove ash from one basin and stockpile into other basin(s).
Haul in borrow material for soil cover and topsoil from offsite source.	Decommission remaining dam(s).	Install engineered cover system including geosynthetic liner, geocomposite drainage layer, 2 feet of soil cover which includes 6 inches of topsoil.	Allow CCR to drain before placing in new on-site landfill.	Repair and resurface haul road (state roads affected by ash hauling outside of plant property).

Exhibit 8.1: Discovery Analysis -- Closure Options				
Table 8.1.2: Explanation of CCR Remediaiton and Closure Options				
Option 1: Hybrid Closure	**Option 2: Closure-In-Place**	**Option 3A: Closure-By-Removal #1 (Existing On-Site Landfill)**	**Option 3B: Closure-By-Removal #2 (Existing & New On-Site Landfills)**	**Option 4: Closure-By-Removal #3 (Off-Site Third Party Landfill)**
Install engineered cover system including geosynthetic liner, geocomposite drainage layer, 2 feet of soil cover which includes 6 inches of topsoil.		Reroute storm water sluice lines from existing coal plant.	Install engineered cover system including geosynthetic liner, geocomposite drainage layer, 2 feet of soil cover which includes 6 inches of topsoil.	Excavate and remove to offsite landfill non-ash items excavated such as stumps, concrete, pipe, large boulders, etc ...
Hydro seed basin to establish surface stabilization.		Grade area once ash removal is completed.	Reroute storm water sluice lines from existing coal plant.	Dewater of basin(s).
		Provide and install erosion control measures.	Grade area once ash removal is completed.	Demo haul road inside the plant property including ash beneath road bed plus an additional foot of soil.
		Decommission remaining dam(s).	Provide and install erosion control measures.	Reroute storm water sluice lines from existing coal plant.
			Decommission remaining dam(s).	Grade area once ash removal is completed.
				Provide and install erosion control measures.
				Decommission of remaining dam(s).

Exhibit 8.1.2 Discovery Analysis Recommended Disallowances

Table 5.2: Summary of Closure Options and Recommended Disallowances			
Plant	**Amount Requested (1/1/15-9/30/18, SCORS DEP 10-08)**	**Closure Option Compliance with Federal CCR Rules**	**Recommended Disallowance**
Asheville	$ 187,540,713	CAMA High Priority - Accelerated Schedule -- Allow Engineering and Planning	$ 98,220,932
Cape Fear	$ 33,631,199	No Federal CCR Requirements	$ 33,631,199
HF Lee	$ 54,775,180	Beneficiation - CAMA Only -- Allow Engineering and Planning	$ 9,207,711
Mayo	$ 25,384,168	Federal CCR Compliant	$ -
Robinson	$ 11,431,675	Federal CCR Compliant and SCDHEC Requirements	$ -
Roxboro	$ 34,070,691	Federal CCR Compliant	$ -
Sutton	$ 255,525,554	CAMA High Priority - Accelerated Schedule -- Allow Engineering and Planning`	$ 208,029,431
Weatherspoon	$ 28,287,429	Excavation and Beneficiation Off-Site -- CAMA -- Allow E&P Through 9/30/17 and Half Costs 10/10 through 9/30/19	$ 6,044,240
Total	**$ 630,646,609**		**$ 355,133,513**

Exhibit 8.3: SOC's and Closure Info by Site

Plant	SOC (Y/N)	SOC Date	SOC Number	# Seeps Included	Monitoring/Reporting Required per SOC	Parameters	Beneficiation (Y/N)	Closure Method	Closure Complete?	Closure Date
Asheville	Y	10/10/2018	EMC SOC WQ S17-010	3 constructed seeps, 22 non-constructed seeps, 1 instream monitoring location	- Interim Seep Report, within 90 days after coal fired generation ceases and no later than April 30, 2020. - Seep Characterization Report for any seeps not dispositioned, no later than June 30, 2020. - Quarterly seep monitoring and reporting. Report findings of exceedances within 60 days to DWR. - Proposed amendments to the Closure Plan no later than August 31, 2020. - Quarterly decanting status reports.	- Annual: TSS, oil and grease - Quarterly: pH, fluoride, mercury, barium, zinc, arsenic, boron, cadmium, chromium, copper, thallium, lead, nickel, selenium, nitrate/nitrite, bromides, sulfates, chlorides, TDS, hardness, temperature, conductivity	4 million tons of ash were used at the Asheville airport.	Excavation to offsite landfill in Homer, GA. Some ash went to Cliffside.	1982 pond is closed as of 2015. The rest is still underway.	Priority site for CAMA, originally 2019, extended to 2022.
Cape Fear	N	Expected Q1 2019	N/A	N/A	N/A	N/A	Y	Onsite beneficiation unit, will involve at least 300,000 tons per year.	N	Per CAMA, must be complete by 2029.
HF Lee	N	Expected Q1 2019	N/A	N/A	N/A	N/A	Y	Onsite beneficiation unit, will involve at least 300,000 tons per year.	N	Per CAMA, must be complete by 2029.
Mayo	Y	8/16/2018	EMC SOC WQ S18-005	2 constructed seeps, 11 non-constructed seeps	- Quarterly seep monitoring. Report findings of exceedances within 60 days to DWR. - Quarterly decanting status reports. - Annual surveys to identify new seeps and examine existing seeps. Report on any new seeps, changes to existing ones, or dispositioned seeps. - Final Seep Report 90 days after completion of decanting. - Seep Characterization Report 60 days after Final Seep Report. - Proposed amendment to Closure Plan 60 days after Seep Characterization Report.	- Annual: TSS, oil and grease - Quarterly: pH, fluoride, mercury, barium, zinc, arsenic, boron, cadmium, chromium, copper, thallium, lead, nickel, selenium, nitrate/nitrite, bromides, sulfates, chlorides, TDS, hardness, temperature, conductivity	N	Cap in place.	N	?
Robinson	N	N/A	N/A	N/A	N/A	N/A	N	Excavation to onsite landfill	N	?
Roxboro	Y	8/16/2018	EMC SOC WQ S18-005	8 constructed seeps, 12 non-constructed seeps, 1 instream monitoring location	- Quarterly seep monitoring. Report findings of exceedances within 60 days to DWR. - Quarterly decanting status reports. - Annual surveys to identify new seeps and examine existing seeps. Report on any new seeps, changes to existing ones, or dispositioned seeps. - Final Seep Report 90 days after completion of decanting. - Seep Characterization Report 60 days after Final Seep Report. - Proposed amendment to Closure Plan 60 days after Seep Characterization Report.	- Annual: TSS, oil and grease - Quarterly: pH, fluoride, mercury, barium, zinc, arsenic, boron, cadmium, chromium, copper, thallium, lead, nickel, selenium, nitrate/nitrite, bromides, sulfates, chlorides, TDS, hardness, temperature, conductivity	N	Cap in place.	N	?
Sutton	N	N/A	N/A	N/A	N/A	N/A	N	Excavation to onsite landfill. Due to tight time constraints, some ash was hauled offsite to Brickhaven Mine.	N	Per CAMA, must complete by August 1, 2019
Weatherspoon	N	In Progress	N/A	N/A	N/A	N/A	Y	Excavation to cement kilns in South Carolina, contracted for 230,000-280,000 tons per year.	N	?

Exhibit 8.4: Water Supply Spends to Reduce Risk Classification				
		DEP		
Plant	**Basin**	**Risk Classification May 18, 2016**	**Risk Classification Nov 14, 2018**	**CAMA Water Supply Costs (source - discovery response 9-06)**
Asheville	1964 Ash Basin	High	no change	$186,054
	1982 Ash Basin	High	no change	
Cape Fear	1956 Ash Pond	Intermediate	no change	$11,756
	1963 Ash Pond	Intermediate	no change	
	1970Ash Pond	Intermediate	no change	
	1978 Ash Pond	Intermediate	no change	
HF Lee	Active Ash Pond	Intermediate	no change	$603,002
	Polishing Pond	Intermediate	no change	
	Ash Pond #1	Intermediate	no change	
	Ash Pond #2	Intermediate	no change	
	Ash Pond #3	Intermediate	no change	
Mayo	Ash Pond	Intermediate	Low	$334,703
Roxboro	East Ash Pond	Intermediate	Low	$1,697,802
	West Ash Pond	Intermediate	Low	
Sutton	1971 Ash Pond	High	no change	$156,699
	1984 Ash Pond	High	no change	
Weatherspoon	Ash Pond	Intermediate	no change	$154,440

Exhibit 8.5: Water Supply Spends to Reduce Risk Classification				
		DEP		
Plant	**Basin**	**Risk Classification May 18, 2016**	**Risk Classification Nov 14, 2018**	**CAMA Water Supply Costs (source - discovery response 9-06)**
Asheville	1964 Ash Basin	High	no change	$186,054
	1982 Ash Basin	High	no change	
Cape Fear	1956 Ash Pond	Intermediate	no change	$11,756
	1963 Ash Pond	Intermediate	no change	
	1970Ash Pond	Intermediate	no change	
	1978 Ash Pond	Intermediate	no change	
HF Lee	Active Ash Pond	Intermediate	no change	$603,002
	Polishing Pond	Intermediate	no change	
	Ash Pond #1	Intermediate	no change	
	Ash Pond #2	Intermediate	no change	
	Ash Pond #3	Intermediate	no change	
Mayo	Ash Pond	Intermediate	Low	$334,703
Roxboro	East Ash Pond	Intermediate	Low	$1,697,802
	West Ash Pond	Intermediate	Low	
Sutton	1971 Ash Pond	High	no change	$156,699
	1984 Ash Pond	High	no change	
Weatherspoon	Ash Pond	Intermediate	no change	$154,440
			TOTAL	**$3,144,456**

Dan Wittliff
Exhibit 9.1
Virginia Dominion Excavation

UTILITY DIVE

BRIEF

Virginia lawmakers strike deal on bill directing Dominion to excavate coal ash

By Catherine Morehouse

Published Jan. 25, 2019

Dive Brief:

- Virginia legislators reached an agreement to move forward on a bipartisan bill Thursday that would require Dominion Energy to excavate all the coal ash at their Virginia coal plants, over 27 million cubic yards.

- The agreement drew support from both Republican and Democratic members of the House and Senate, as well as Gov. Ralph Northam, D, and will also require that at least a quarter of the waste be recycled. The remaining ash would have to be moved into fully lined basins to prevent further groundwater contamination.

- Dominion Energy had originally indicated its preference for a "cap in place" closure, the favored method of most utilities, but an analysis released by Dominion in November found that it would be more cost effective to recycle a portion of the ash and sell it to interested bidders than initially reported.

Dive Insight:

The agreement among Virginia lawmakers on Thursday marks a rare legislative intervention against utility plans to store coal ash at their plant sites as companies continue to clash with environmental groups over the most effective methods to handle the waste.

There was "very much a battle over whether this bill would get passed in any substantial form," Nate Benforado, staff attorney at the Southern Environmental Law Center who worked closely on the legislation, told Utility Dive.

"It's a huge development that really shows how far we've come over the past few years" and represents an "understanding of environmental risks of existing contamination and understanding there's a cost-effective solution," he said.

While most utilities argue that leaving the waste in place is effective and more economic, environmental groups have long said that method does not adequately protect groundwater.

After a report from Earthjustice in December found that 67 coal plants across 22 states were violating federal pollution standards at their coal ash sites, several environmental groups filed a petition for review against the Environmental Protection Agency, concerned that utilities weren't being forced to excavate those sites quickly enough.

Five plants on that list were owned by Dominion Energy in Virginia, and groundwater filings showed all of those plant sites would require cleanup after reporting unsafe levels of metal contaminants including cobalt, lithium and arsenic.

Four coal ash ponds near the Chesapeake Bay Watershed in the state have been subject to legislation over the past two years, which prevented Dominion from using the cap in place closure method until a more holistic assessment was made. The economics of recycling a portion of the waste and the environmental implications for excavating all Virginia pits entirely led to the "very unique" bipartisan agreement, said Benforado.

Recycling the waste has proven to be effective in other states across the Southeast, many of which have sites near waterways that are vulnerable to flooding, especially as storms continue to intensify from warming waters. Duke Energy recycled 79% of the ash it produced in 2018, and 68% in its North Carolina territory,

where record-breaking rains from Hurricane Florence triggered a coal ash spill in September that released more than 2,000 cubic yards of the waste.

Recycling "is a very feasible cost-effective approach that's working in other states like North Carolina and South Carolina and should be working in Virginia too. And I think the sort of culmination of having a commercially successful closure method that permanently solves the environmental problem ... I think that's what led to where we are now," said Benforado.

Dominion did not attend an event with state officials announcing the bill agreement on Thursday. But the utility "supports the comprehensive agreement reached by the Governor, legislative leaders, and members of the General Assembly that accomplishes clean closure, minimizes truck traffic, and prudently manages customer costs for the closing of ash ponds at our power stations," it said in a statement emailed to Utility Dive.

NORTH CAROLINA Environmental Quality NC DEQ

Dan Wittliff
Exhibit 9.2
NC DEQ Press Release 18May16

State releases deadlines for coal ash pond closures, will request changes to coal ash law

RALEIGH

May 18, 2016

The state environmental department today released proposed classifications for all coal ash ponds in North Carolina, while at the same time asking the General Assembly to allow the reconsideration of those classifications 18 months from now. The classifications are based on the current risk of each pond's impact on public health and the environment. However, work that is already either planned or underway could significantly change the risk posed by the ponds.

"The deadlines in the coal ash law are too compressed to allow adequate repairs to be completed," said Donald R. van der Vaart, secretary of the state environmental department. "It also does not allow for revisions to the classifications based on new information about a pond's risk to public health and the environment."

The proposed classifications include the eight mandated as high priority under the law, and 25 classified by today's action as intermediate. High risk ponds must be dug up and closed by 2019 and intermediate ponds must be dug up and closed by 2024. The main risk factors driving today's classifications were dam deficiencies that are currently being repaired, and potential impacts to nearby groundwater. Recent discussions indicate that providing nearby residents permanent alternative water will relieve any future concerns.

"The focus of the coal ash law was to safely close all coal ash ponds in North Carolina," continued Secretary van der Vaart. "The intent was not to set pond closure deadlines based on incomplete information. Making decisions based on incomplete information could lead to the expenditure of billions of dollars when spending millions now would provide equal or better protection. The understanding we have today reflects countless hours of scientific and technical work by both state engineers and Duke Energy as well as thousands of comments by the public."

Although no dams present an imminent risk to life or property, a number of ponds were rated intermediate because of unfinished repairs. State regulators will use their existing legal authority to ensure those repairs are completed by the end of this year.

The residents' well water meets federal requirements for safe drinking water. However, Duke Energy has submitted a study that evaluates the feasibility of supplying permanent alternative water to nearby residents. The state environmental department will recommend to the General Assembly that the classifications be re-evaluated after the dam safety repairs are made and the utility provides these permanent alternative water sources to nearby well owners.

These proposed classifications will become final 60 days from today.

For a map of the proposed classifications for each coal ash impoundment, click here (http://portal.ncdenr.org/c/document_library/get_file?p_l_id=1169848&folderId=26884096&name=DLFE-125497.pdf)

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A table that shows the risk factors that determined each pond's classification can be found here (http://portal.ncdenr.org/c/document_library/get_file?p_l_id=1169848&folderId=26884096&name=DLFE-125496.pdf)

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This press release is related to:

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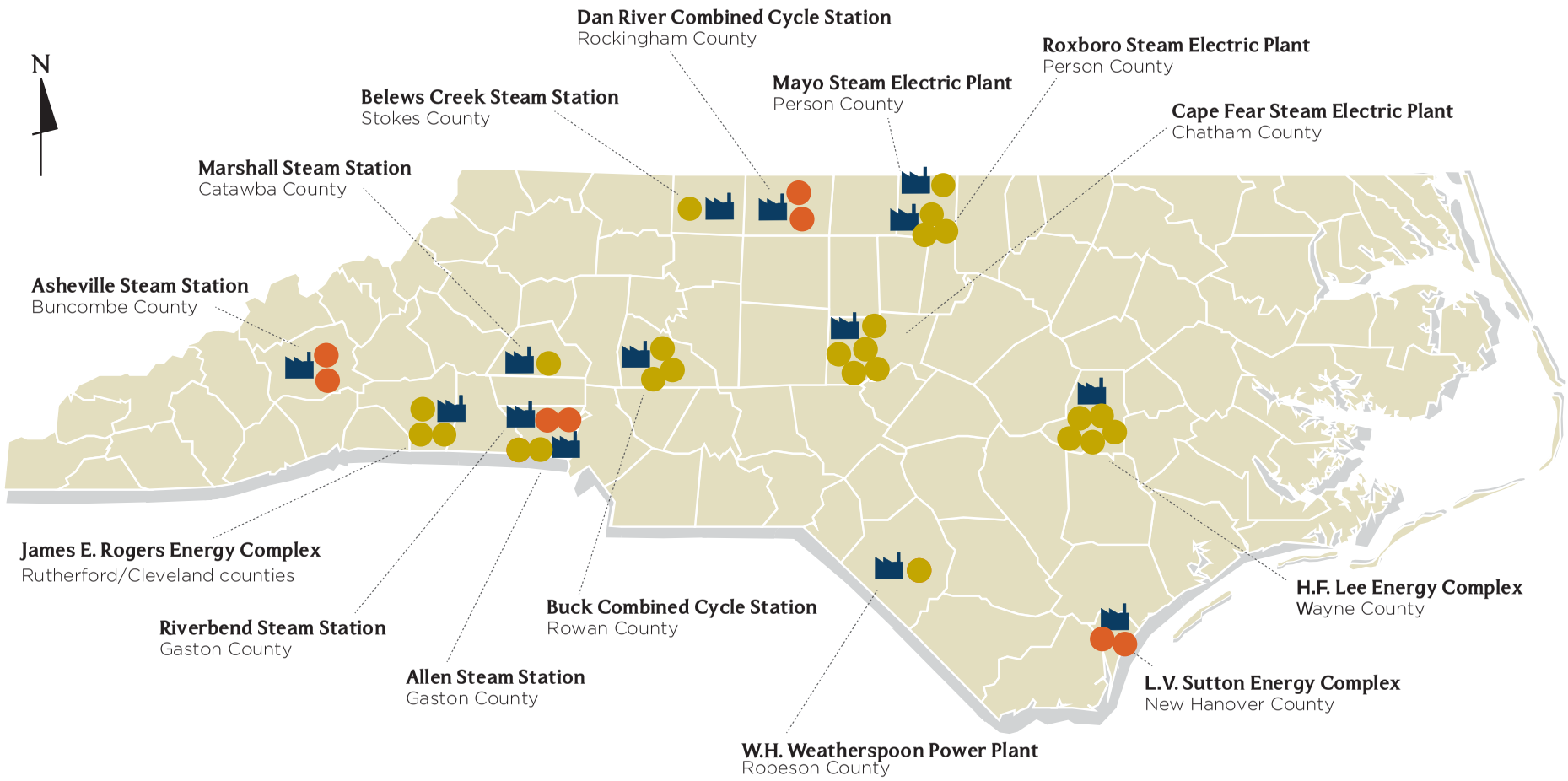
Proposed Classifications



Environmental Quality

CLASSIFICATION	CLOSURE DEADLINE
High	2019
Intermediate	2024
Low	2029

N.C. DEQ | Not To Scale | May 18, 2016

EXHIBIT DJW - 9.2
Page 3 of 7

Proposed Classifications Chart

In accordance with the coal ash law, the state environmental department has proposed the risk classification for all coal ash ponds in North Carolina as intermediate based on current conditions and available data, except for those already designated high priority by the coal ash law. If all necessary modifications and dam repairs included in the Notice of Deficiencies had been made to DEQ's satisfaction, and if nearby wells were determined to not be affected by the coal ash ponds to DEQ's satisfaction, or permanent alternate water was made available to nearby residents, then these basins would have been classified as low. The coal ash law does not grant DEQ the authority to change a pond's classification based on new information after the final proposed classifications are released. DEQ will recommend that the law be changed to reflect dam safety repairs or the removal of any threat to drinking water. DEQ would consider these subsequent actions or impose such conditions and reclassify the basins if the state law granted this authority.

Facility	Basin	Dam Safety State ID	Original Draft Proposed Risk Classification	NEW PROPOSED RANKINGS**			PROPOSED RISK CLASSIFICATION
				Surface Water Rankings	Dam Safety Ranking	Groundwater Ranking	
Allen Steam Station	Active Ash Basin	GASTO-061	Low to Intermediate	Low	Intermediate	Intermediate	**INTERMEDIATE**
Allen Steam Station	Retired Ash Basin	GASTO-016	Low to Intermediate	Low	Intermediate	Intermediate	**INTERMEDIATE**
Asheville Steam Station	1964 Ash Basin	BUNCO-089					**HIGH***
Asheville Steam Station	1982 Ash Basin	BUNCO-097					**HIGH***
Belews Creek Steam Station	Active Ash Basin	STOKE-116	Low to Intermediate	Intermediate	Intermediate	Intermediate	**INTERMEDIATE**
Buck Combined Cycle Station	Ash Basin 1	ROWAN-068 & ROWAN-069	Low to Intermediate	Low	Low	Intermediate	**INTERMEDIATE**
Buck Combined Cycle Station	Ash Basin 2	ROWAN-070 & ROWAN-071	Low to Intermediate	Low	Low	Intermediate	**INTERMEDIATE**
Buck Combined Cycle Station	Ash Basin 3	ROWAN-047	Low to Intermediate	Low	Intermediate	Intermediate	**INTERMEDIATE**

Proposed Classifications Chart

Facility	Basin	Dam Safety State ID	Original Draft Proposed Risk Classification	NEW PROPOSED RANKINGS**			PROPOSED RISK CLASSIFICATION
				Surface Water Rankings	Dam Safety Ranking	Groundwater Ranking	
Cape Fear Steam Electric Plant	1956 Ash Pond	CHATH-075	Intermediate	Intermediate	Intermediate	Intermediate	**INTERMEDIATE**
Cape Fear Steam Electric Plant	1963 Ash Pond	CHATH-076	Intermediate	Intermediate	Intermediate	Intermediate	**INTERMEDIATE**
Cape Fear Steam Electric Plant	1970 Ash Pond	CHATH-077	Intermediate	Intermediate	Intermediate	Intermediate	**INTERMEDIATE**
Cape Fear Steam Electric Plant	1978 Ash Pond	CHATH-078	Intermediate	Intermediate	Intermediate	Intermediate	**INTERMEDIATE**
Cape Fear Steam Electric Plant	1985 Ash Pond	CHATH-079	Intermediate	Intermediate	Intermediate	Intermediate	**INTERMEDIATE**
Dan River Combined Cycle Station	Primary Ash Basin	ROCKI-237					**HIGH***
Dan River Combined Cycle Station	Secondary Ash Basin	ROCKI-238					**HIGH***
H. F. Lee Energy Complex	Active Ash Pond	WAYNE-022	Intermediate	Intermediate	Intermediate	Intermediate	**INTERMEDIATE**
H. F. Lee Energy Complex	Polishing Pond	WAYNE-034	Intermediate	Intermediate	Intermediate	Intermediate	**INTERMEDIATE**
H. F. Lee Energy Complex	Ash Pond #1	WAYNE-031	Intermediate	Intermediate	Low	Intermediate	**INTERMEDIATE**

Proposed Classifications Chart

Facility	Basin	Dam Safety State ID	Original Draft Proposed Risk Classification	NEW PROPOSED RANKINGS**			PROPOSED RISK CLASSIFICATION
				Surface Water Rankings	Dam Safety Ranking	Groundwater Ranking	
H. F. Lee Energy Complex	Ash Pond #2	WAYNE-032	Intermediate	Intermediate	Low	Intermediate	**INTERMEDIATE**
H. F. Lee Energy Complex	Ash Pond #3	WAYNE-033	Intermediate	Intermediate	Low	Intermediate	**INTERMEDIATE**
James E. Rogers Energy Complex (formerly Cliffside Steam Station)	Active Ash Basin	CLEVE-049 & CLEVE-050	Low to Intermediate	Intermediate	Intermediate	Intermediate	**INTERMEDIATE**
James E. Rogers Energy Complex (formerly Cliffside Steam Station)	Retired Unit 1-4 Basin	CLEVE-047	Low	Low	Low	Intermediate	**INTERMEDIATE**
James E. Rogers Energy Complex (formerly Cliffside Steam Station)	Retired Unit 5 Basin	RUTHE-070 & RUTHE-072	Low	Low	Intermediate	Intermediate	**INTERMEDIATE**
Marshall Steam Station	Ash Basin	CATAW-054	Low to Intermediate	Intermediate	Intermediate	Intermediate	**INTERMEDIATE**
Mayo Steam Electric Plant	Ash Pond	PERSO-035	Low	Intermediate	Intermediate	Intermediate	**INTERMEDIATE**
Riverbend Steam Station	Primary Ash Basin	GASTO-097					**HIGH***
Riverbend Steam Station	Secondary Ash Basin	GASTO-098					**HIGH***

Proposed Classifications Chart

Facility	Basin	Dam Safety State ID	Original Draft Proposed Risk Classification	NEW PROPOSED RANKINGS**			PROPOSED RISK CLASSIFICATION
				Surface Water Rankings	Dam Safety Ranking	Groundwater Ranking	
Roxboro Steam Electric Plant	Unnamed Eastern Extension Impoundment	NA	Intermediate	Low	N/A	Intermediate	**INTERMEDIATE**
Roxboro Steam Electric Plant	East Ash Pond	PERSO-033	Low to Intermediate	Low	Intermediate	Intermediate	**INTERMEDIATE**
Roxboro Steam Electric Plant	West Ash Pond	PERSO-038 & PERSO-039	Low	Low	Intermediate	Intermediate	**INTERMEDIATE**
L. V. Sutton Energy Complex	1971 Ash Pond	NEWHA-005					**HIGH***
L. V. Sutton Energy Complex	1984 Ash Pond	NEWHA-004					**HIGH***
W. H. Weatherspoon Power Plant	Ash Pond	ROBES-009	Intermediate	Intermediate	Intermediate	Intermediate	**INTERMEDIATE**
*Legislated risk classifications: Deemed high priority for closure by part II, section 3(b) of the Coal Ash Management Act of 2014.							
**Classifications are based on available data received as of May 1, 2016.							

NORTH CAROLINA *Environmental Quality* NC DEQ

Dan Wittliff
Exhibit 9.3
NC DEQ Press Release 14Nov18

RELEASE: DEQ approves low-risk classification of seven coal ash impoundment facilities

Raleigh

Nov 14, 2018

The N.C. Department of Environmental Quality (DEQ) has determined that Duke Energy has met the low-risk classification criteria set forth in the Coal Ash Management Act (CAMA) for coal combustion residuals surface impoundments located at Duke Energy's Allen, Belews Creek, Buck, Rogers (formerly Cliffside), Marshall, Mayo, and Roxboro facilities.

Pursuant to CAMA, DEQ found that Duke Energy had established permanent water supplies and rectified dam safety deficiencies at coal ash impoundments located at the seven Duke Energy facilities. By law, a low-risk coal combustion residuals surface impoundment may, at the election of DEQ, be closed by excavation, cap in place, or a hybrid approach.

To that end, DEQ will hold public information meetings where the public can provide input on closure options. The public information meetings will be announced at a later date.

This press release is related to:

RELEASE: DEQ approves low-risk classification of seven coal ash impoundment facilities

NCDEQ (/news/press-releases?field_agency_department_tid=642&field_agency_department_tid_op=or)

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